AUTOMOTIVE INDUSTRIES

MAY 1, 1953

AUTOMOTIVE and AVIATION MANUFACTURING
CIVILIAN AND DEFENSE
ENGINEERING • PRODUCTION • MANAGEMENT

In This Issue... Indianapolis Race Preview · · · · SAE Production Meeting · · · · Ideal Automatic Transmission · · · · Advanced Combustion Chamber Designs · · · · Valve Testing Device · · · · Tooling for J-47 Turbojets

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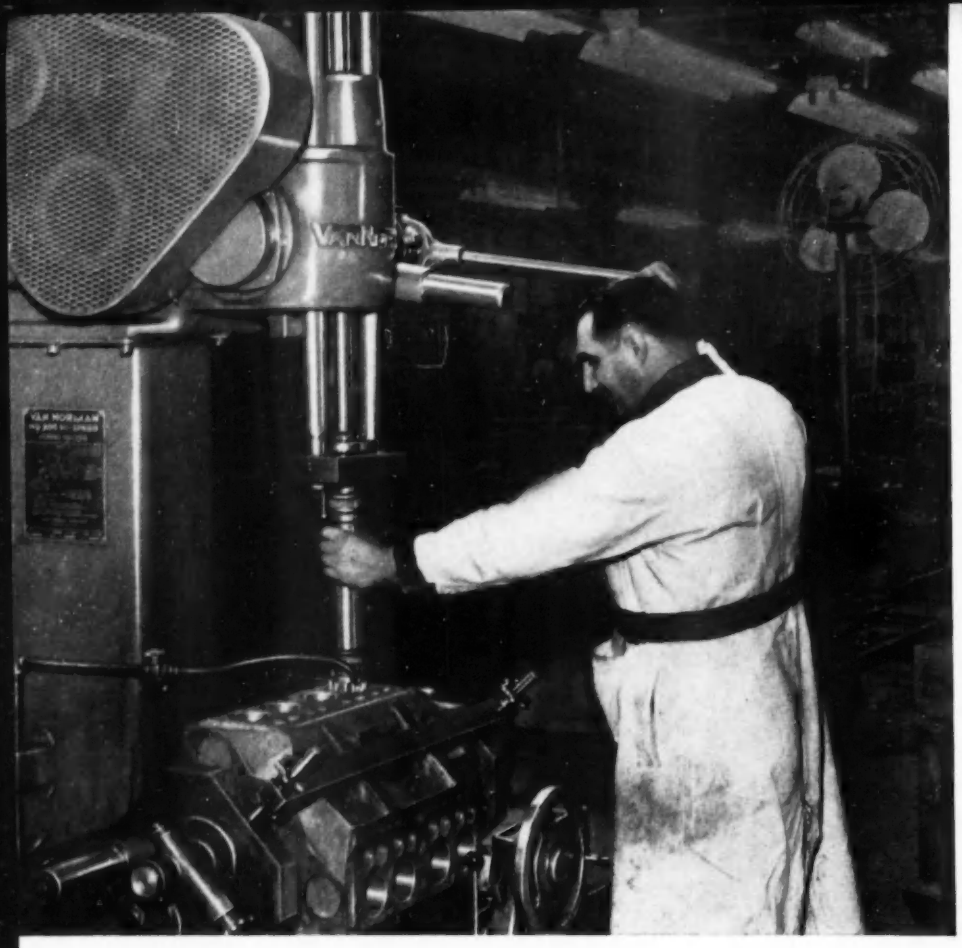

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A midwest metalworking company—rebuilder of a popular automobile engine—had a cutting oil problem. On the honing operation, shown above, the finish obtained on engine cylinders did not measure up to the high quality desired by that firm. Various honing oils were tried without measurable improvements.

The problem was put to a Standard Oil cutting oil specialist. He recommended the use of STANICUT Oil No. 62 FC, a light-colored, light-bodied cutting oil that contains the correct proportion of extreme-pressure and friction-reducing ingredients. From every angle, STANICUT has proved ideal for the job. The desired finish has been obtained on the cylinders. Tool life has been greatly increased. Oil consumption has been reduced.

Whatever your machining operation, the Standard Oil cutting oil specialist serving your area of the Midwest has the cutting oil that will meet your needs. He has the experience and special training necessary to help you get better cutting oil results. How you can get his help easily and quickly is explained at the right. Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

What's YOUR Problem?

J. E. Weston, of Standard Oil's Kansas City office, is the lubrication specialist who helped this metalworking company solve a "finish" problem on the honing operation described at the left.

Like all of the many Standard lubrication specialists located throughout the Midwest, he has the experience and special training necessary to analyze his customer's needs. Like all of Standard's lubrication specialists, he is close at hand and therefore able to give his customer on-the-spot assistance.

You can reach the lubrication specialist serving your area of the Midwest by phoning your local Standard Oil office. He will be glad to discuss your operations and with no obligation to you. There may be savings for you in the benefits offered by such outstanding cutting oils as:

STANICOOL HD Soluble Oil — Because it contains additional compounding, this heavy-duty soluble oil possesses not only the cooling ability of an emulsion but also the ability to give better tool life and finer finishes than can be obtained with a conventional soluble oil.

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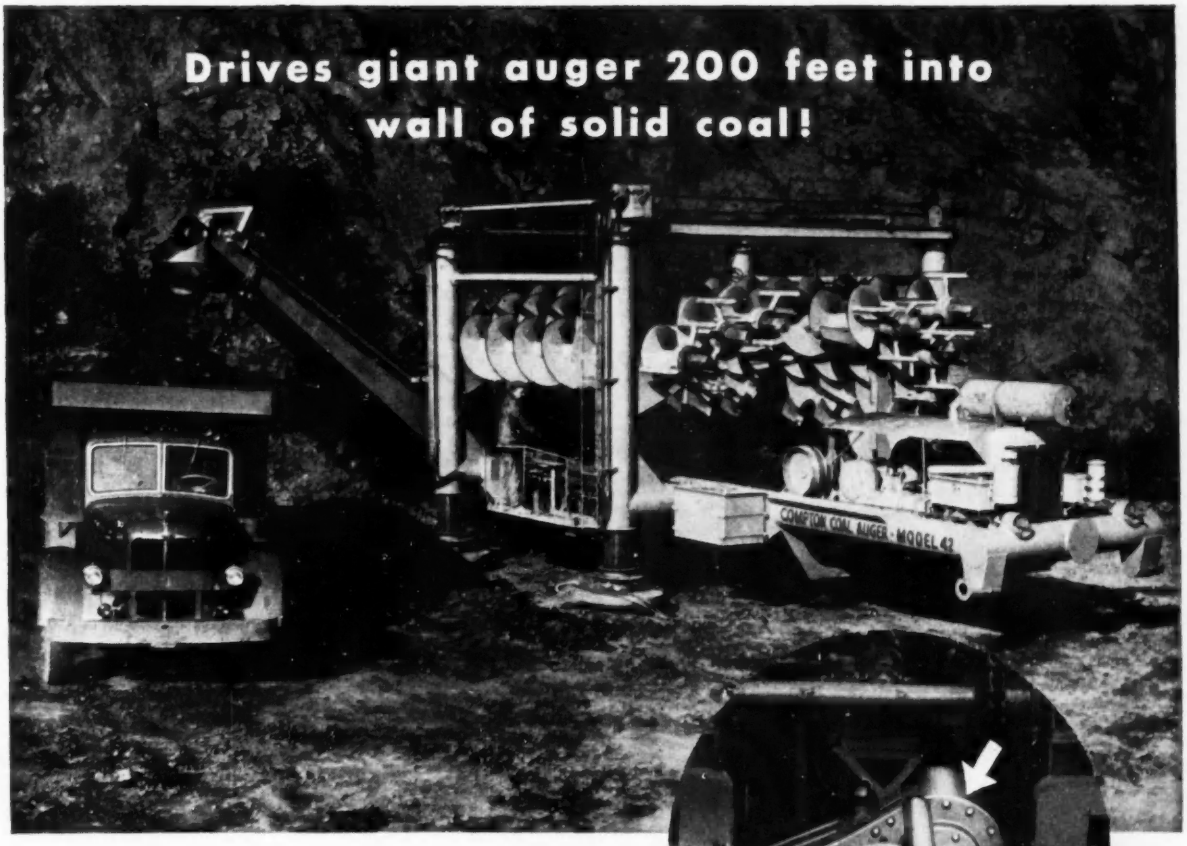

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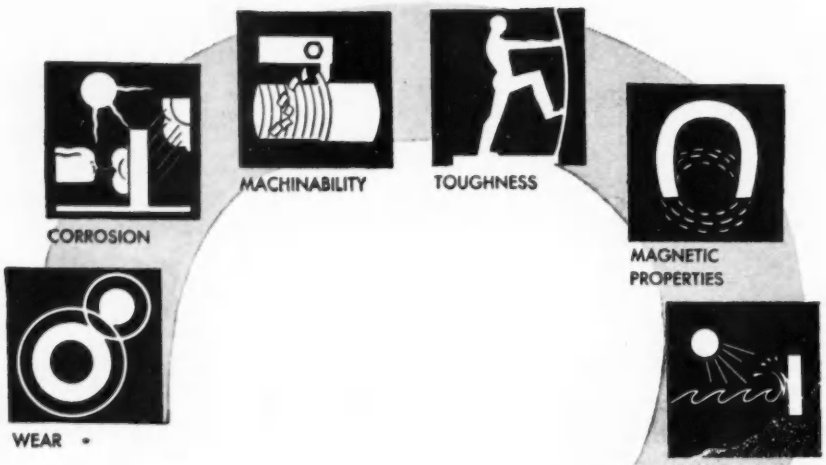

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AUTOMOTIVE INDUSTRIES

MAY 1, 1953 VOL. 108, NO. 9

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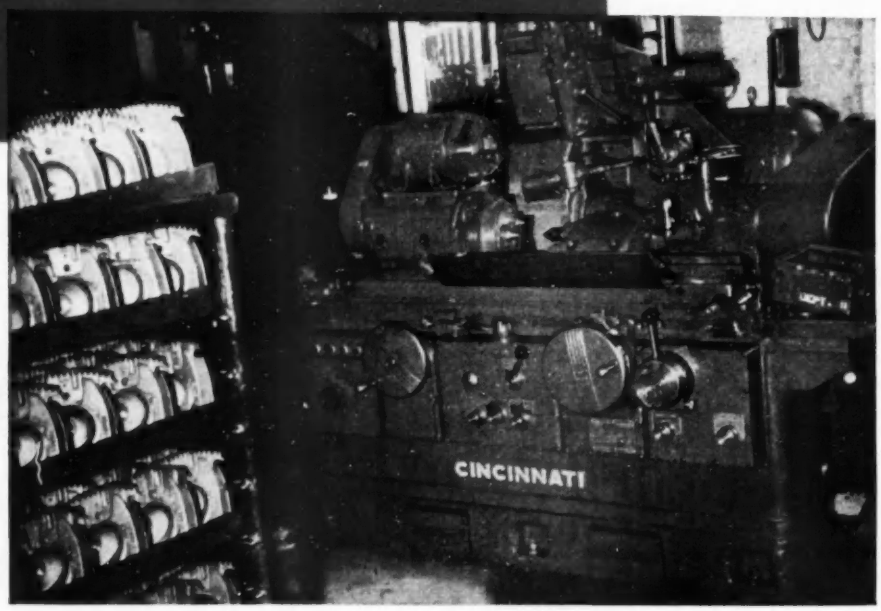

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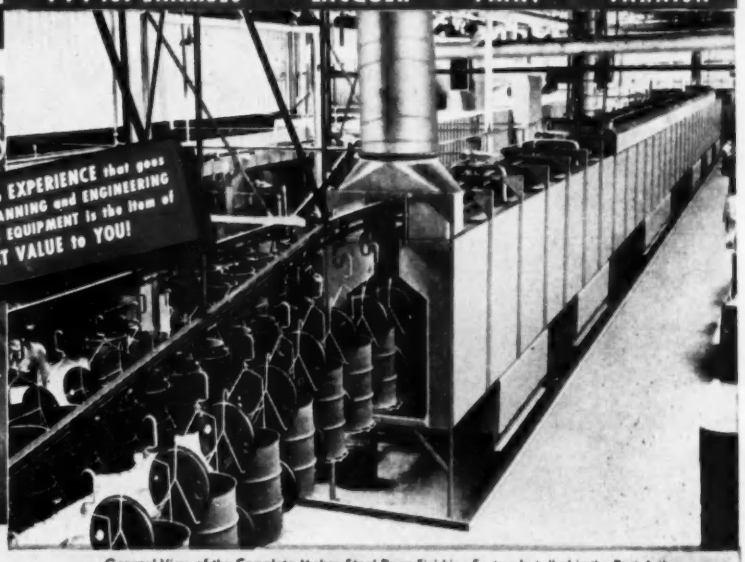
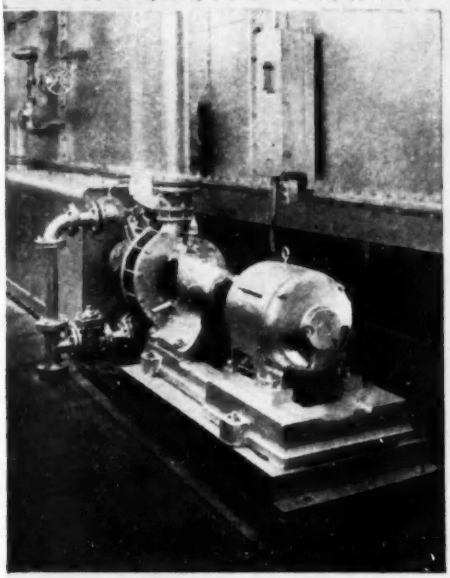


General View of the Complete Mahon Steel Drum Finishing System Installed in the Port Arthur, Texas, Plant of U. S. Steel Products Division of the United States Steel Corporation.



One of the large Acid Recirculating Pumps employed in the Pickling and Descaling Stage of the Mahon Equipment illustrated above. Corrosive resistant material is employed for Pumps, all Piping, Solution Tanks, Processing Tunnel Housing and other parts exposed to corrosive materials.

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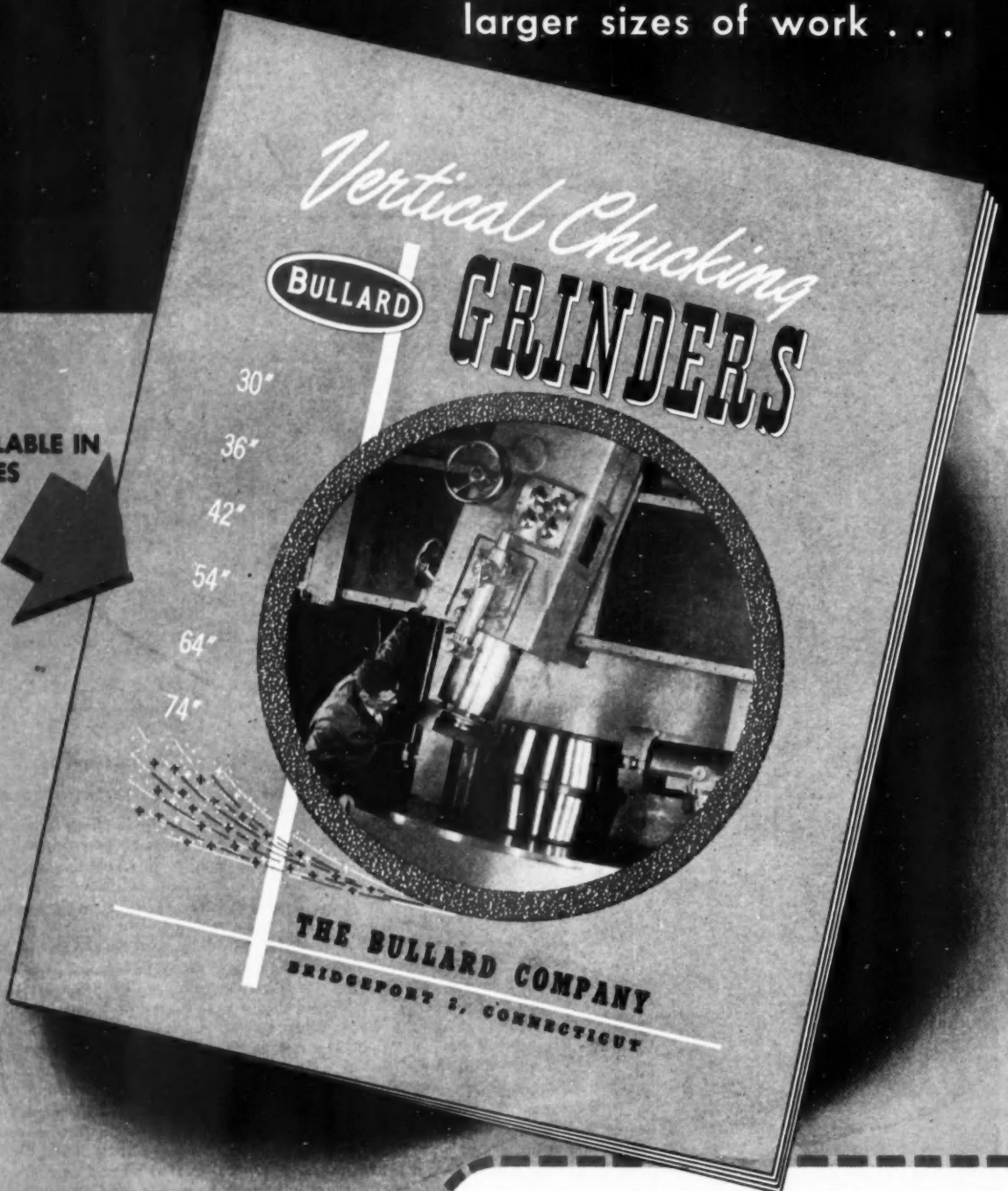

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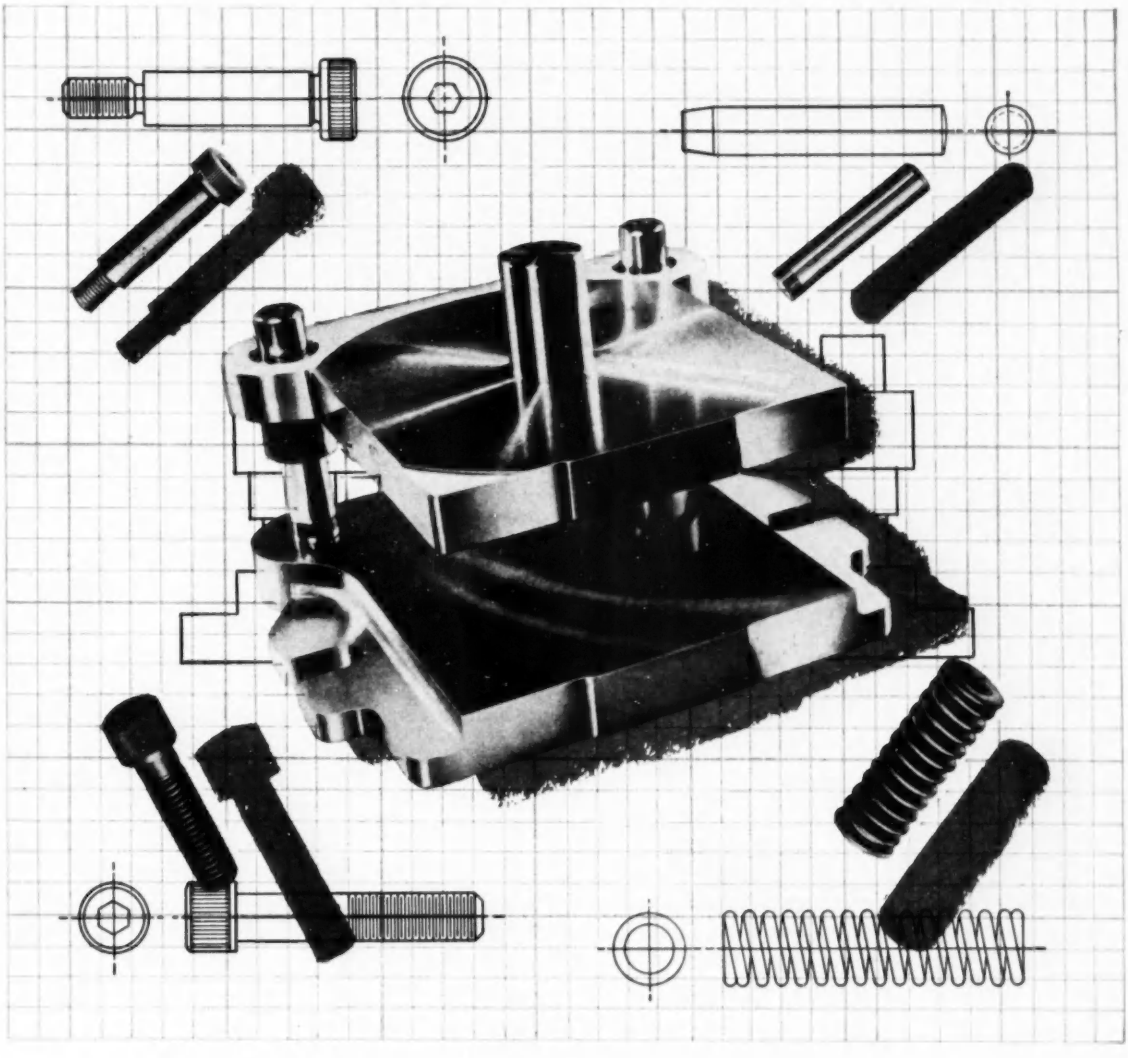

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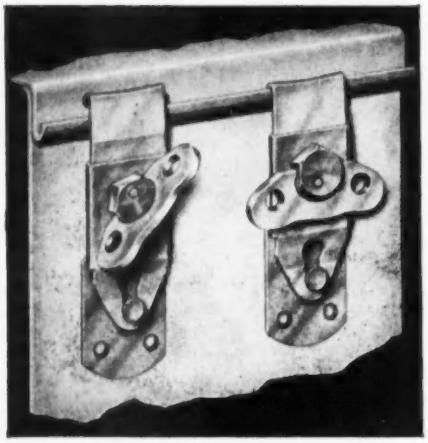
File: Simmons LINK-LOCK



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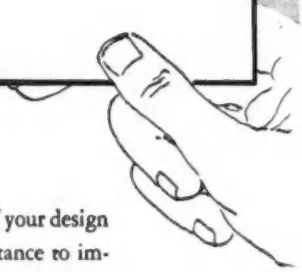

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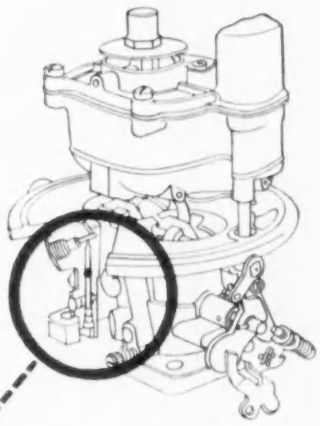

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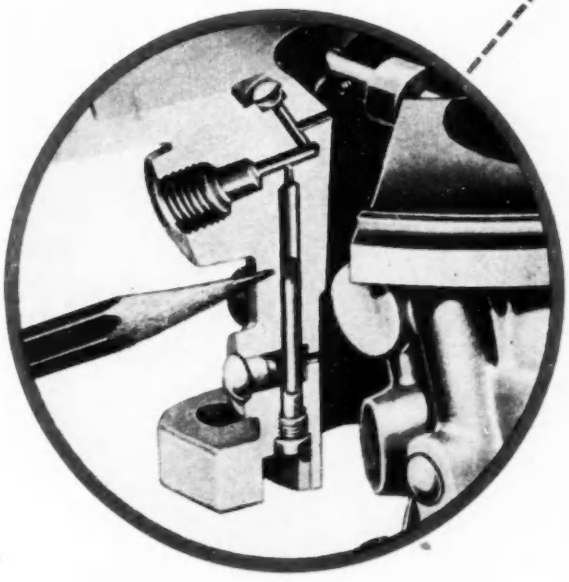

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Lightweight distributor-passage ball is tough, resilient, non-corrosive

Engine "ping" is often experienced in automotive engines during periods of rapid acceleration. Engineers of the Holley Carburetor Company have designed an automatic spark control to overcome this condition. The control unit's action is initiated by a ball check valve in an air passage in the carburetor body. It is actuated by pressure differential between the venturi and manifold. To achieve the desired sensitivity of control, the ball material had to be lightweight, yet resistant to corrosion, gasoline and oil fumes, abrasion and impact.

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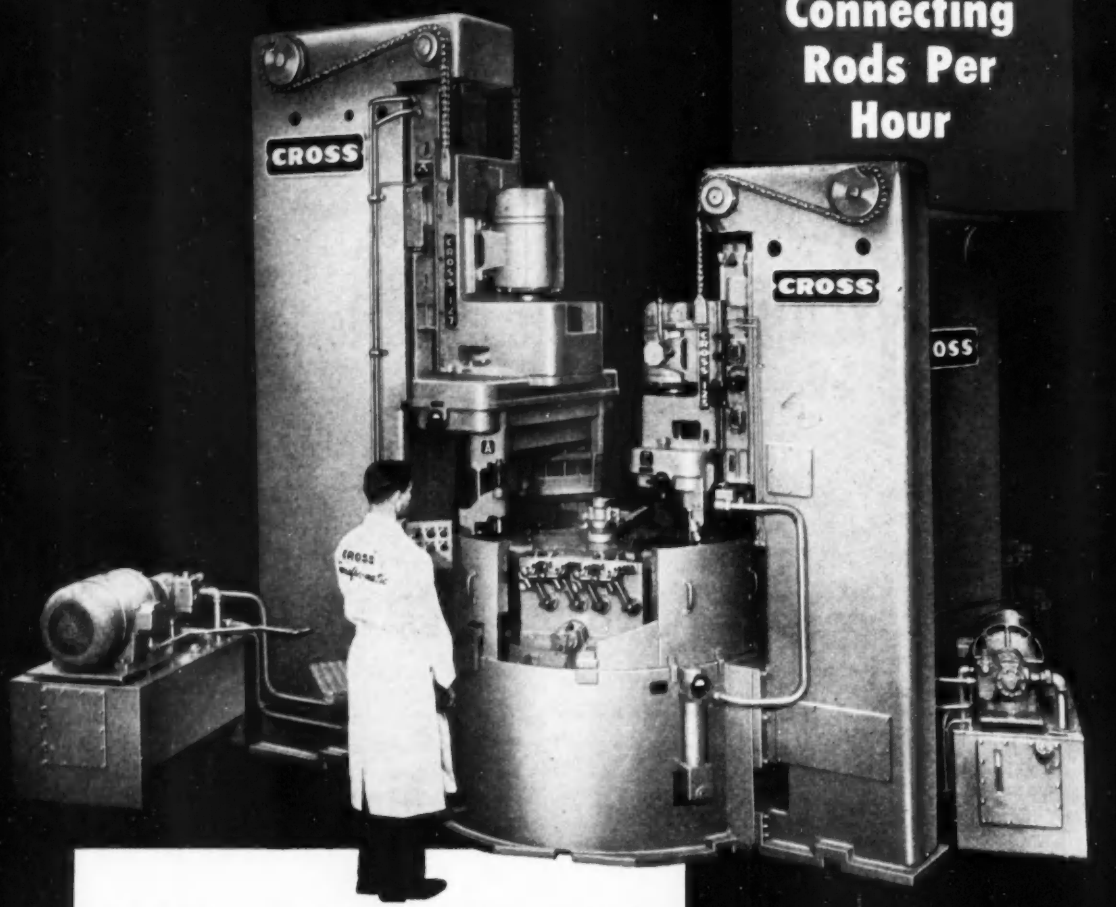

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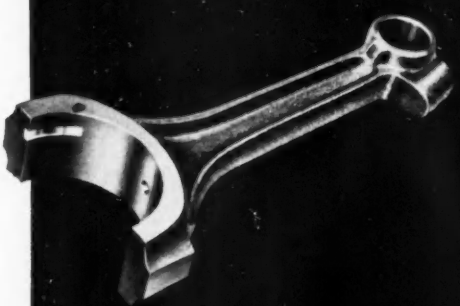

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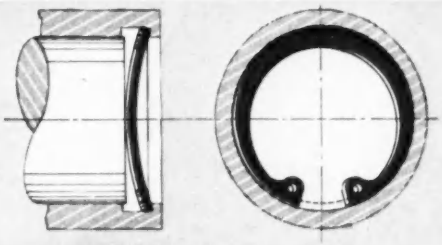

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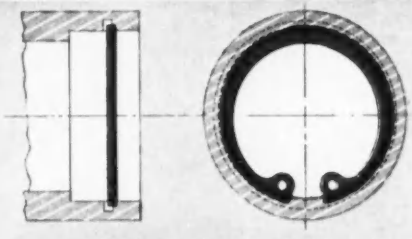

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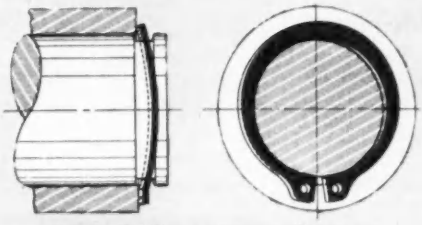
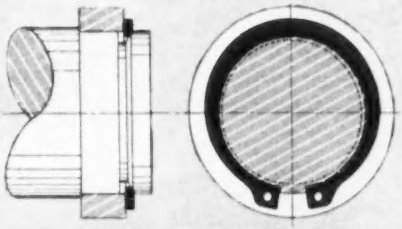


series 5101 · external type
for shaft diameters from: .188 – 1.438 in.



series 5102 · external type
for shaft diameters from: 1 – 10 in.

bowed WALDES TRUARC RETAINING RINGS

Take up end-play resiliently, damp vibrations and oscillations. Bent like a bow out of plane at horizontal center line. The bowed Truarc ring acts in axial direction like a floating spring without losing its tight grip against the bottom of the groove.

Maximum resilient end-play take-up: .015″ to .020″ depending on size of ring.

beveled WALDES TRUARC RETAINING RINGS

Take up end-play rigidly. When the ring is contracted (or expanded), the tapered edge acts like a wedge moving deeper into the groove and shifting in an axial direction until the ring abuts the machine part.

Maximum end-play take-up, depending on ring size: internal types, .005″ to .043″; external types, .005″ to .040″.

WALDES TRUARC is much more than a better way to hold parts together

Thousands of manufacturers have already found that Truarc Retaining Rings cut production costs and speed assembly by simplifying product design. But that's not all.

Waldes Truarc engineers have extended the use of retaining rings by developing rings that perform *additional functions* while acting as retaining shoulders. Those shown here take up end-play, compensate for wear and varying manufacturing tolerances.

No matter what *your* problem, there's a Waldes Truarc Ring designed specifically to solve it. Send us your drawings, your questions—Waldes Truarc engineers will work with you, at no obligation.

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TRUARC
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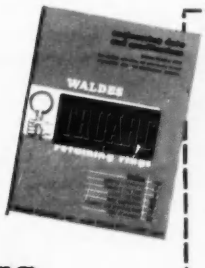
RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

WALDES TRUARC RETAINING RINGS AND PLIERS ARE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 2,382,047; 2,382,048; 2,410,851; 2,420,921; 2,420,341; 2,420,785; 2,441,846; 2,455,165; 2,483,380; 2,483,383; 2,487,002; 2,487,903; 2,491,308; 2,509,081 AND OTHER PATENTS PENDING.



Waldes Kohinoor, Inc., 47-16 Austel Place, L. I. C. 1, N. Y.

Please send me the new Waldes Truarc Retaining Ring catalog. AY-855

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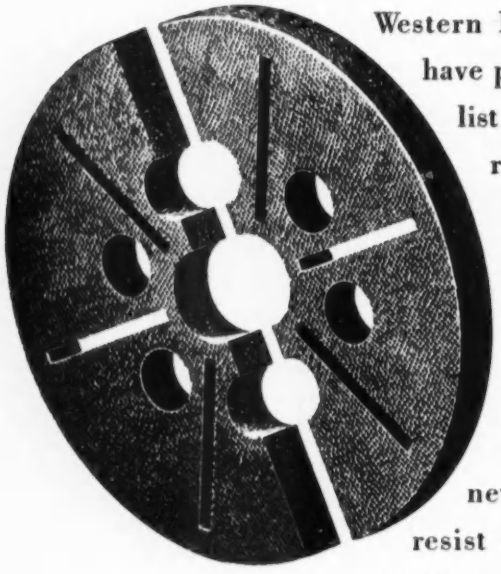
*Plus Value



Western Felt users over a long period of years have placed their stamp of approval on a long list of its products. They know from experience the "plus value" in every Western Felt component part. Highest precision in its processing and cutting produces a uniformity that minimizes rejections—prevents failure of the finished product from felt causes. They are available from wool softness to rock hardness—never lose shape—do not ravel or fray—resist oil, water, age—are resilient, flexible, compressible—may be cut to close tolerances.

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DALLAS, TEXAS PLANT

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DELPARK Engineers are available for consultation with customers on the most satisfactory method of delivering the paint and water to the filter.

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Backed by More Than 30 Years in Industrial Filtration

Delpark INDUSTRIAL FILTRATION

PATENTS PENDING

INDUSTRIAL FILTRATION COMPANY
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Gentlemen: Please send more information on Paint Spray Booth Applications of DELPARK *Industrial Filters.*

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The Crankshaft

—backbone of the internal combustion engine.

Modern Trends—more r.p.m.'s, higher compression ratios, more power per cubic inch of displacement—all lend additional emphasis to the importance of crankshaft quality.

Wyman-Gordon Experience—the most extensive in the industry, assures the maximum in physical properties, uniform machinability, and balance control.

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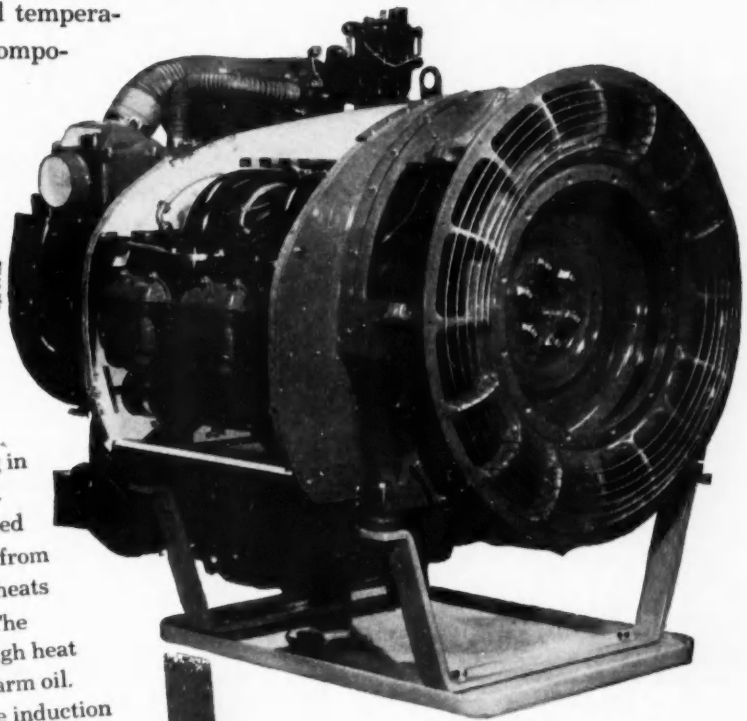
...AIRBORNE PRE-HEATER PROVIDES STARTING IN LESS THAN 30 MINUTES AT 65° BELOW!

Meeting the stiffest requirements of cold-weather starting, the South Wind Heater can be used for pre-heating any engine in the Packette series. Makes starting easier, faster at all temperatures by flooding engine components, battery, crankcase and carburetor with warm heated air.



Duct carries hot air...

to crankcase through opening in block to heat inside of engine. Engine is completely shrouded to capture heat as it escapes from interior—this warm air pre-heats exterior surface of engine. The heater exhaust passes through heat exchanger in oil sump to warm oil. Hot air is diverted to engine induction system for starting phase.

There's a South Wind Heater for every Pre-Heating need

Do You Have A Heating Problem? South Wind is prepared to install pre-heating systems in every way to answer your requirements. Write today for the experienced counsel of South Wind field engineers about *any* problem in external or internal pre-heating. Wide range of South Wind Heaters includes 20,000–30,000–50,000–100,000–200,000 and 600,000 BTU/hr. capacities. Stewart-Warner Corporation, South Wind Division, Indianapolis, Ind.

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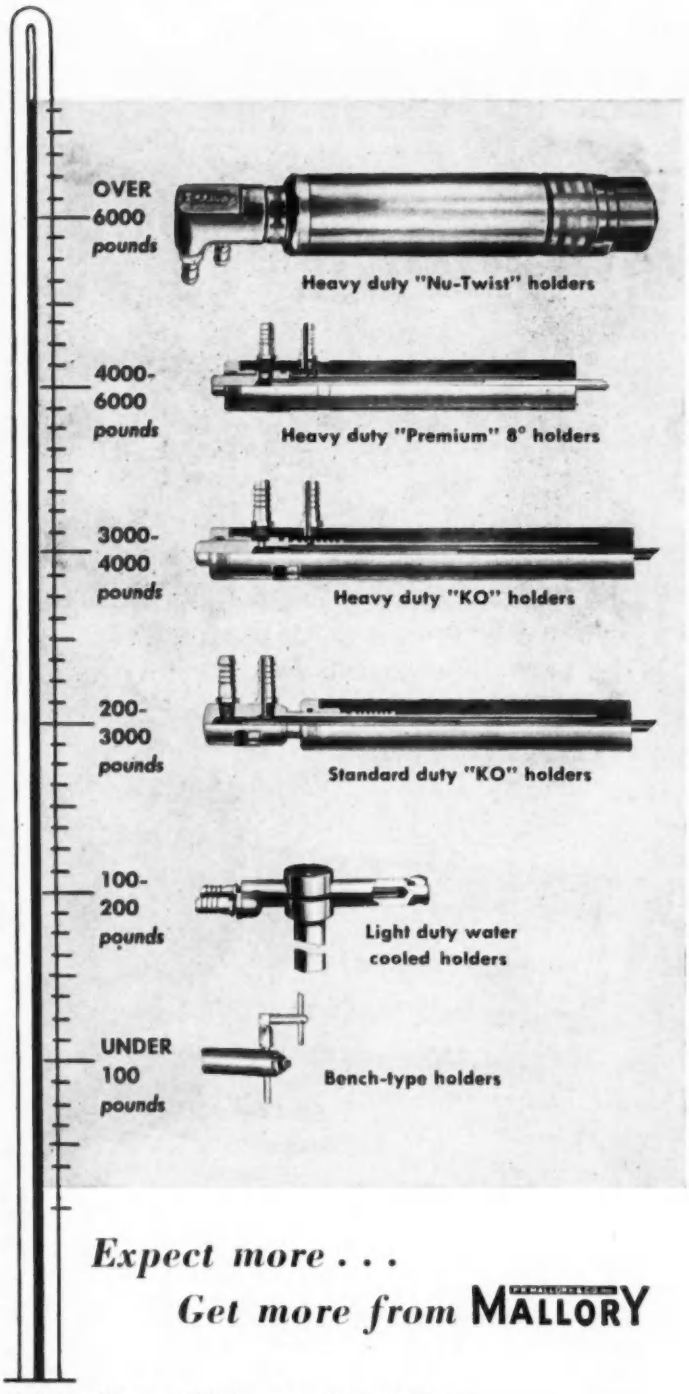
You Name The Welding Pressure . . . .

Mallory has the holders and electrodes in stock

Resistance welding pressures from under 100 pounds to over 6,000 pounds can be handled by standard Mallory holders and electrodes . . . available from stock. The new Mallory "Nu-Twist"* holders and electrodes will perform in the high pressure ranges needed for welds to meet all present military specifications . . . as well as the most demanding commercial requirements.

Because holders and electrodes are available in a wide variety of shapes and sizes, standard units can be combined to handle practically any resistance welding job without the cost or delay of special designs.

Like to see our complete line? Then write to us, or have your Mallory distributor drop by with a copy of Catalog 550C. See for yourself the complete range of holders, electrodes and accessories that are on the shelf for immediate delivery.



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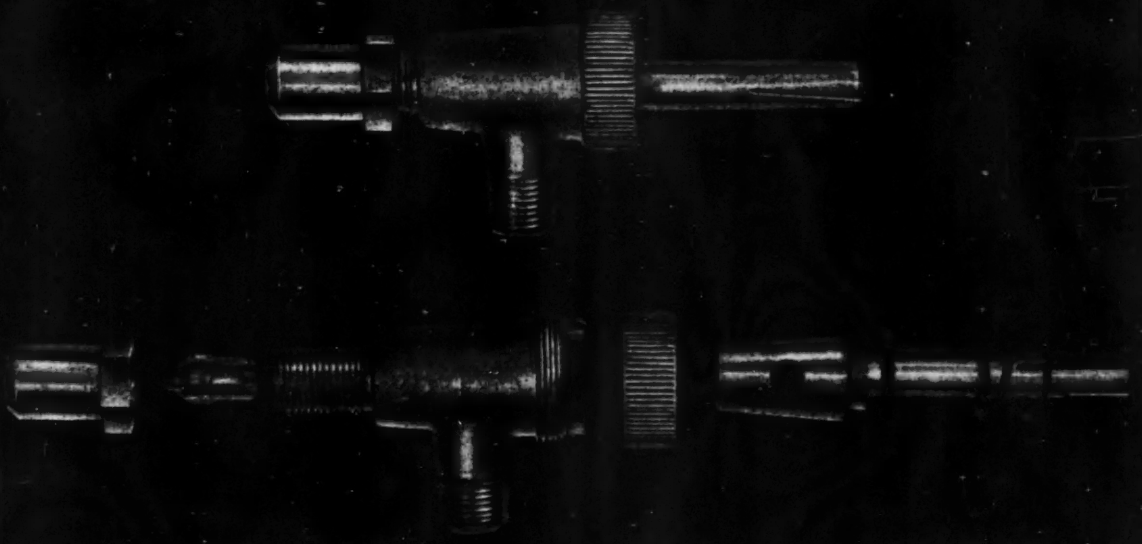
Brass is Best



Kitchen range burner valve by Lincoln Brass Works, Inc., Detroit 16, Mich. Two different brasses are used in this valve, which is entirely of brass except for the washer and spring. Lincoln also makes valves for heaters and furnaces; flow, drain and shut-off valves for gasoline lines; shut-off valves for agricultural sprayers, and a wide variety of tube and pipe fittings, all entirely or chiefly of free-cutting brass rod and free-machining brass forgings.

Mr. D. E. DuPerow, Vice-President of Lincoln Brass Works, Inc., recently said: "Thirty-six years of brass use by Lincoln and complete acceptance by the trade is the best reason I can think of for brass superiority. If there had been any material better for our purpose, less expensive to fabricate, and more desirable to our customers, we would be using it now."

Brass has many desirable characteristics. Here are five of them that are important in Lincoln valves and fittings: 1, corrosion resistance, which means no plating is required. 2, high speed precision machining for high output, lower costs. 3, sound, non-porous structure of rod and forgings. 4, smooth performance; brass holds lubricants. 5, customer satisfaction; gas range burner valves pass the cycling test of being raised to 425°F. and back to room temperature a minimum of 10,000 times without seizure, loss of free operation, or leakage.

There are many other items besides valves that can profitably make use of the fine qualities of Revere Brass. The Revere Technical Advisory Service will gladly cooperate with manufacturers on the selection of the correct brass and its fabrication. Just call the nearest Revere Sales Office; see your telephone directory. Or write direct.

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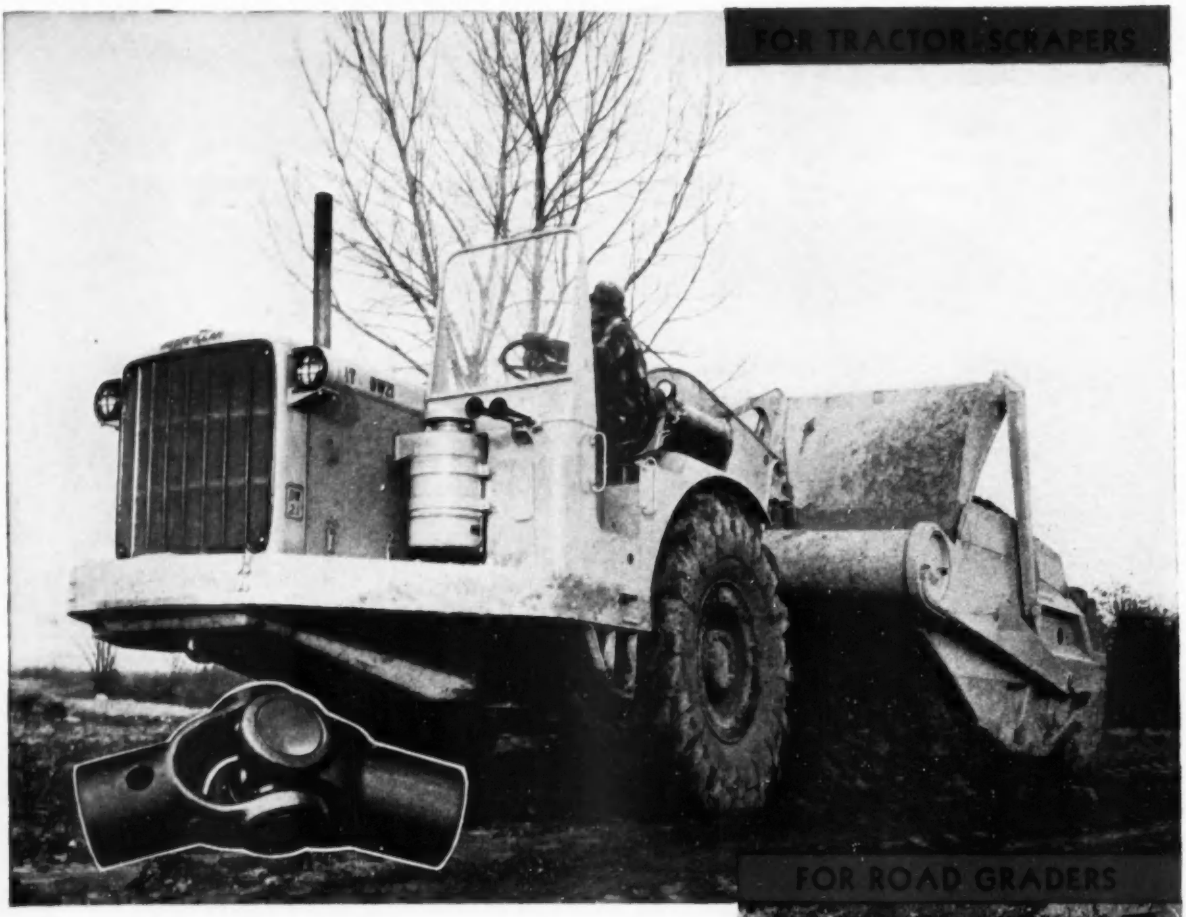

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STAYNEW INTAKE FILTERS GIVE

GREATER EFFICIENCY *plus* POSITIVE PROTECTION

IT'S A FACT! A filter which is 99.9% efficient is *9 times* as effective as one that is 99.0% efficient. Why?—because the filter that is 99.9% efficient lets only *one-ninth* as much dirt into the engine. And, it's the dirt that *gets in* that causes the trouble.

The extreme efficiency of Staynew Intake Filters provides *positive protection*—keeps shutdowns and repairs at an absolute minimum. Efficiency actually increases with use. Staynew Intake Filters are efficient over a wide range of loads and are not affected by temperature changes. And, Staynew Intake Filters effectively protect vital engine parts without carefully held maintenance schedules . . . frequently operating two or more *years* without attention.

Get all the facts. Write today for Bulletin S.I.F.

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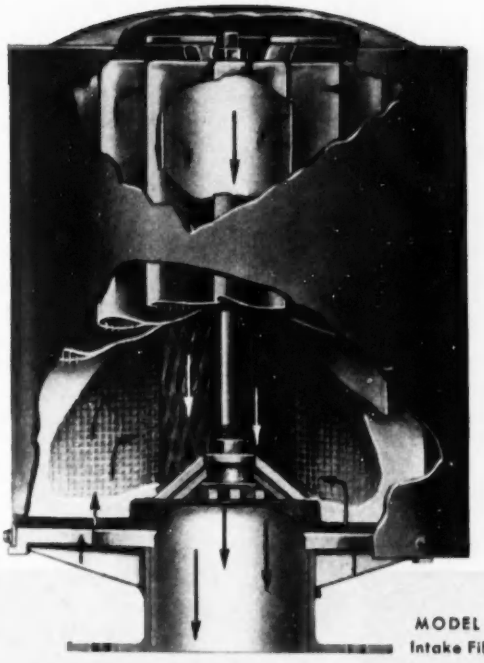

MODEL D
Intake Filter

DOLLINGER PROTECTED STAYNEW FILTERS

DOLLINGER CORPORATION

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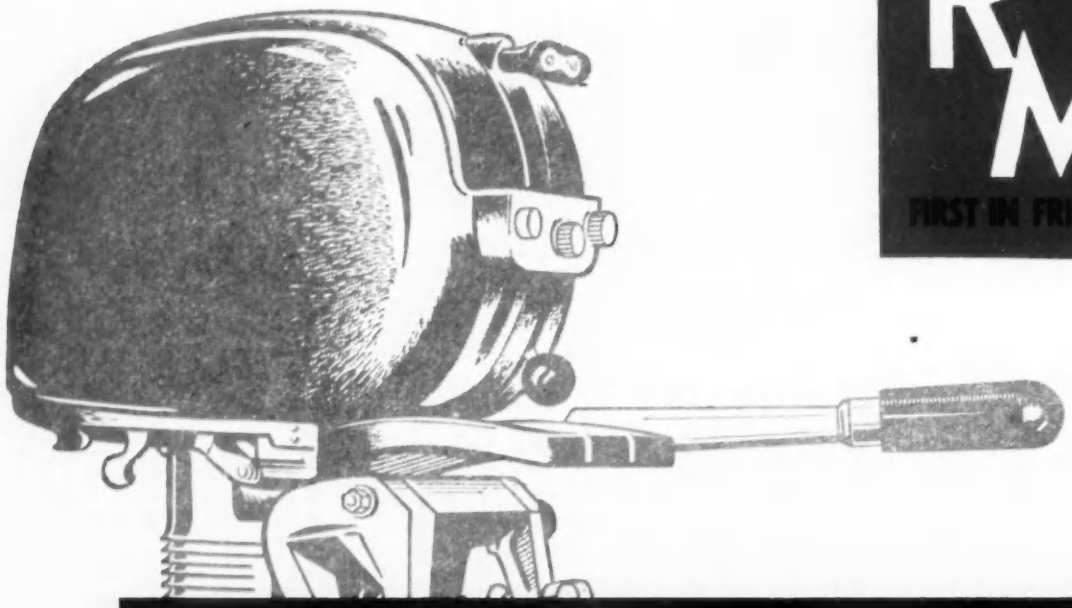
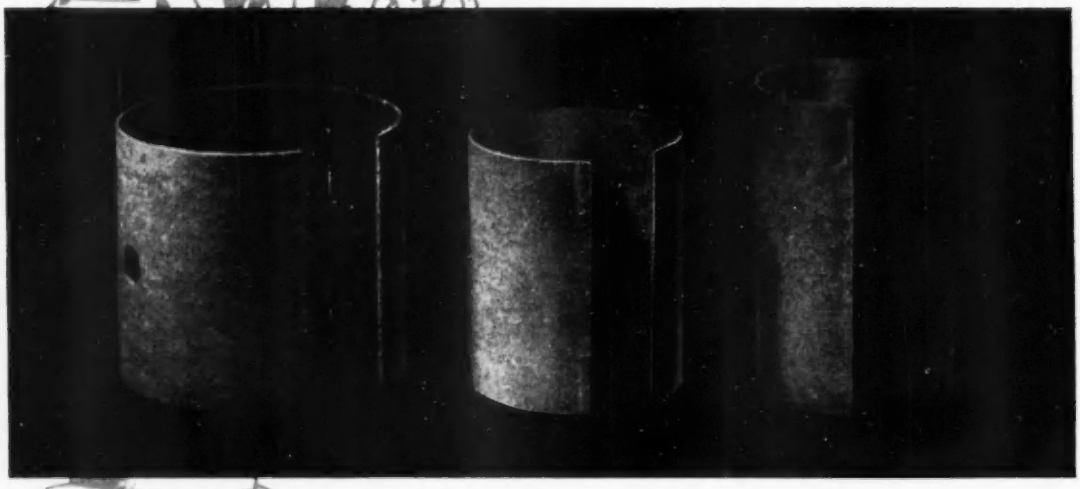
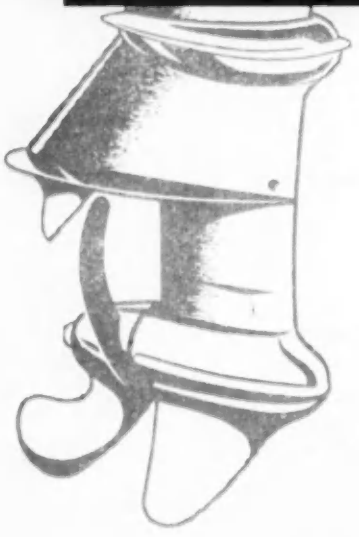
ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED

R/M
FIRST IN FRICTION





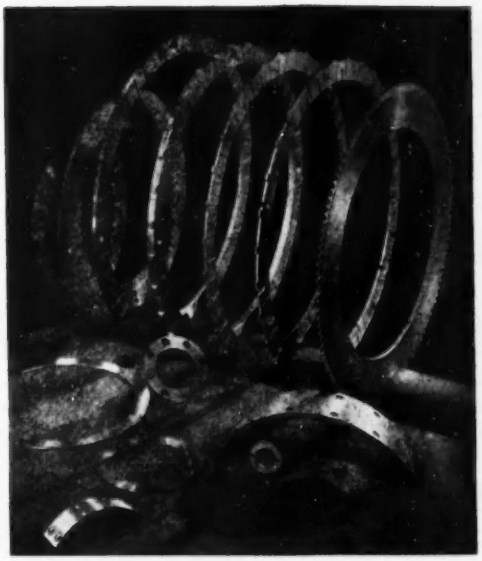


Vibrationless steering is a feature of this famous line of powerful outboards. The parts shown above make it possible. They are collars for different hp motors made of Type 740B R/M friction material. Riding between the steering and swivel brackets, they dampen motor vibration and propeller push. Know-how and experience enable R/M to hold the thickness of these parts to a mere ±.002" without finish grinding.

THE TRADE-MARK THAT SPELLS PROGRESS IN FRICTION MATERIAL DEVELOPMENT!

For every obvious use to which R/M friction materials are put—brake linings, for example—there are hundreds of other important but "not-so-evident" applications. The story at the left tells about one of these.

Many manufacturers in many different industries collaborate with Raybestos-Manhattan, for R/M has a way of anticipating engineering needs and being ready to meet new requirements with advanced-design materials. R/M achieves its outstanding results by working with countless combinations of different types of friction materials . . . including woven and molded asbestos, semi-metallic materials, and sintered metal parts. If you have a friction material problem, call in your R/M representative. Behind him stand all the facilities of the world's largest maker of friction materials—seven great plants, their research departments and their testing laboratories.



Sintered metal parts are solving many problems in industry today. They're exceptionally useful where tolerances are close or operating conditions require immersion in oil. R/M's production capacity for these parts is keeping pace with demand.

Write for your copy of the R/M Engineering Bulletin. It describes and illustrates many R/M friction materials for aviation, agriculture, the automotive industry and others.

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Factories: **Bridgeport, Conn. Manheim, Pa. Passaic, N.J. No. Charleston, S.C. Crawfordsville, Ind. Neenah, Wis. Canadian Raybestos Co. Ltd., Peterborough, Ont.**

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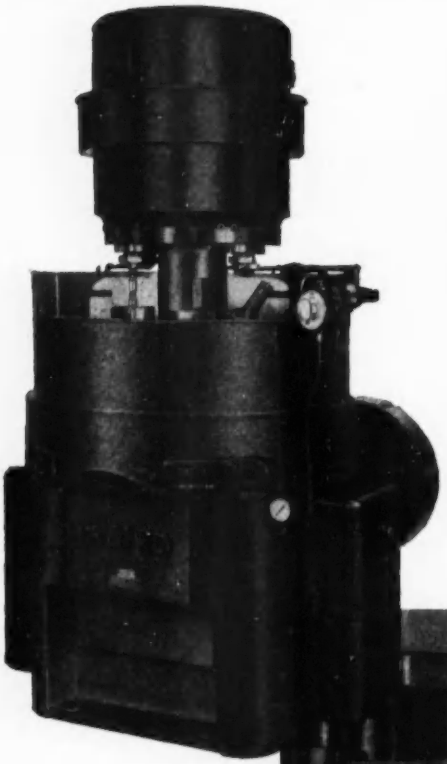
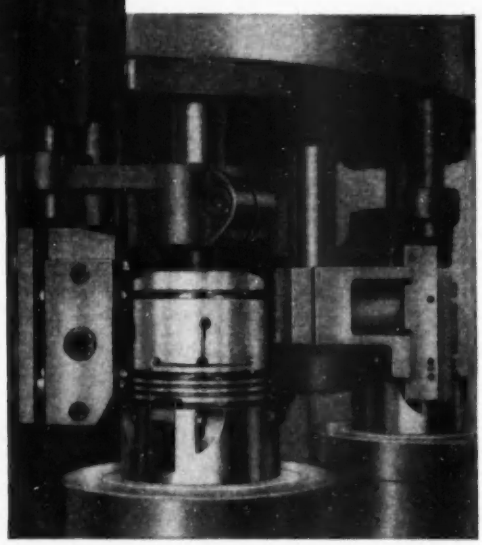
R/M FIRST IN FRICTION

ASK **BAIRD** ABOUT IT!

HIGH PRODUCTION TOOLING



(Above) Front view, showing splash guards for wet cutting.



(Right) Close-up view of a typical Baird tooling set-up.

TOOLS MOVE HORIZONTALLY, OTHERS VERTICALLY, FOR FACING . . . TURNING

. . . and that's but one of the excellent features of Baird's No. 54VC (5" chuck, 4-spindle, vertical continuous lathe). As the turret revolves, eliminating unproductive indexing time, holding fixtures grip and release automatically for easy loading and unloading. Tools feed in and out of the cutting stroke.

Typical applications are boring piston ends, facing, chamfering, turning bands, etc., for wet or dry cutting of light jobs. In most cases, the spindle carrier cycle time is 12 - 38 seconds; production time 3 - 9 seconds per piece; cutting time 9 - 28.5 seconds.

Safety for operator and prevention against machine and product damage are mechanically and electrically controlled; tools cannot feed to work unless spindles are revolving; electrical equipment is enclosed, wiring concealed.

FEATURES
BAIRD 4-SPINDLE VERTICAL LATHE

1. Compact design.
2. Easy to tool and operate.
3. Simple . . . dependable.
4. Extremely accurate.
5. Unusually versatile.
6. Outstanding production records.

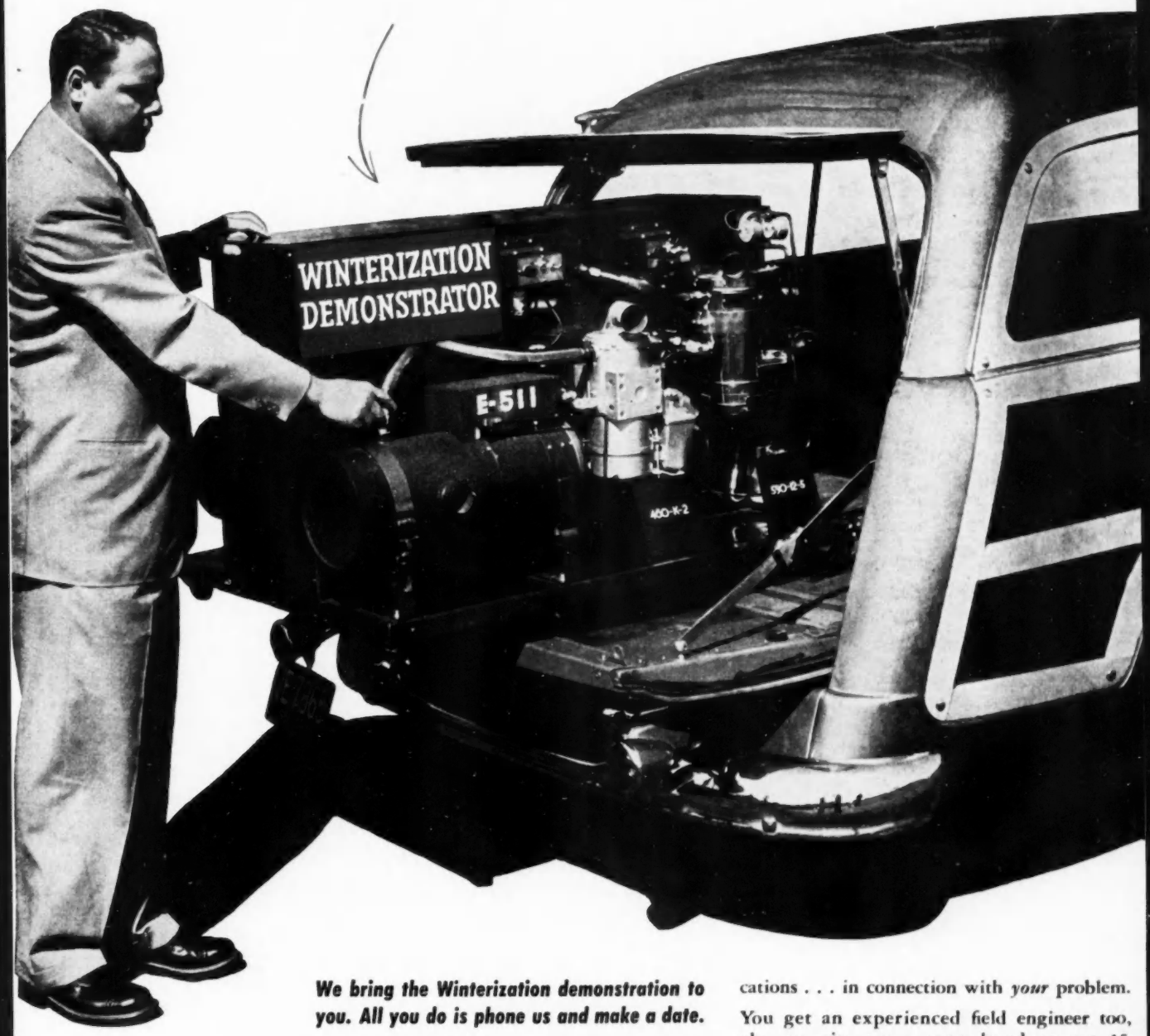
Installation of Baird automatic machines is a step in the right direction against tough competition. "Ask Baird about it!"

5BA53

the BAIRD MACHINE COMPANY
STRATFORD • CONNECTICUT

AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS

RIGHT AT YOUR DOORSTEP



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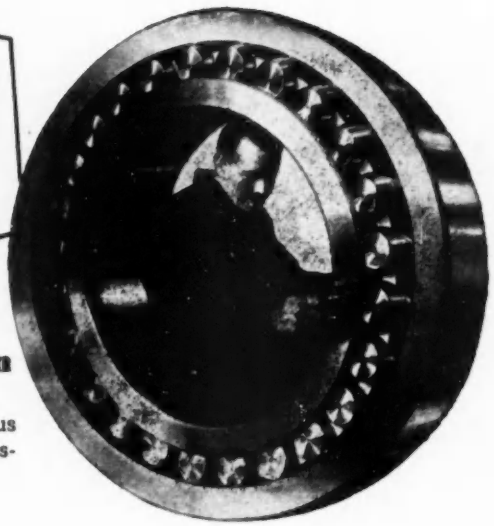
On Perfection's Mobile Demonstrator you can see five different types of heaters—which are the heart of our Winterization Systems—in actual operation. They include fresh air and coolant types ranging from 20,000 to 60,000 B.t.u. capacities. You can try them, pry into them, weigh the advantages of each . . . or modifications . . . in connection with *your* problem.

You get an experienced field engineer too, who can give you answers based on our 15 years of designing and producing winterization systems—over 100,000 installations—for all sizes and types of vehicles and equipment. Winterization Data File on request. Perfection Stove Company, 7392-C Platt Avenue, Cleveland 4, Ohio.

Perfection

This Size . . . . ➧

or This Size . . . . ➧



with all "kinds of sizes" in between

SKF's wide range of bearing types and sizes, plus helpful SKF engineering cooperation, makes it possible for you to select the bearing whose characteristics make it the best bearing choice for your particular application.

SELF-ALIGNING BALL BEARINGS

Compensate for angular misalignment resulting from faulty mounting, shaft deflection or distortion of the foundation. For radial loads and moderate thrust loads in either direction.

SPHERICAL ROLLER BEARINGS

Unexcelled for capacity. Inherently self-aligning. The full capacity of the bearing is always available for useful work. Will carry substantial thrust load in either direction.

DOUBLE-ROW DEEP GROOVE BALL BEARINGS

Embody the same design principle as the single-row type, but have lower axial displacement and substantial thrust capacity in either direction. Have very high radial capacity.

SINGLE-ROW DEEP GROOVE BALL BEARINGS

Sustain, in addition to radial load, substantial thrust load in either direction even at high speeds. Available with famous Pairprene Red Seals which keep dirt out and lubricant in. Also with any combination of Red Seals, shields, and snap-rings. Furnished in standard or precision tolerances.

ANGULAR CONTACT BALL BEARINGS

Support heavy thrust load in one direction, sometimes combined with moderate radial load. Can be mounted singly or in tandem for constant thrust load in one direction; also in pairs, face-to-face or back-to-back, for combined thrust and radial loads.

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Very high radial capacity and low friction which permits high-speed operation. Easy to dismount, even when both rings are mounted with a tight fit.

BALL THRUST BEARINGS

For pure thrust load in one direction only. Not self-aligning. The load line through the balls is parallel to the shaft axis, resulting in high thrust capacity and minimum axial deflection.

SPHERICAL ROLLER THRUST BEARINGS

For heavy thrust loads, or combined loads which are predominantly thrust, at high speeds on vertical or horizontal shafts. Fully self-aligning.

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– manufacturers of **SKF** *and* HESS-BRIGHT *bearings*

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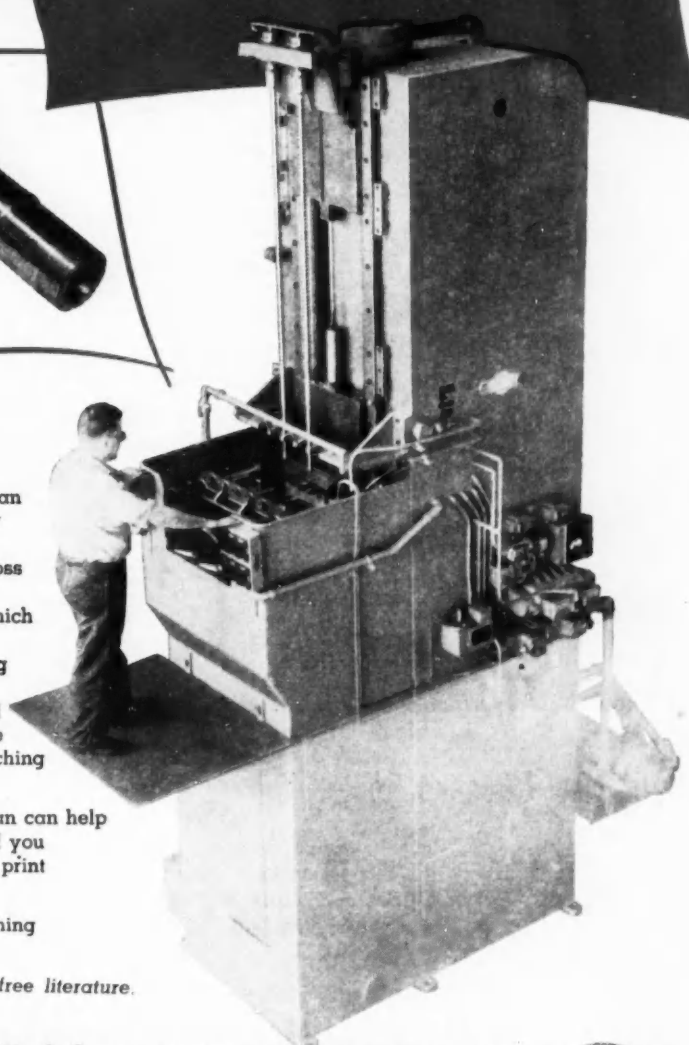
FASTER SPLINE BROACHING

the *American* way

Check these broaching features that make it possible...

- ✓ Multiple station set-up
- ✓ Load while broaching
- ✓ Hydraulic transfer slide
- ✓ Automatic ejection of parts
- ✓ Interchangeable tooling for several parts



Splined holes are broached simultaneously in five parts in one pass on this five-station American 40-Ton 72" stroke pull-down machine. A transfer slide permits the operator to reload parts during the broaching cycle. The parts are loaded on cross hole locating pins mounted on the transfer slide, and then moved into stationary holding jaws, which hold them in broaching position. The slide then moves back allowing the operator to reload during the broaching stroke. After broaching the parts are automatically ejected from the spring loaded holding jaws by a swinging bar. Interchangeable tooling, easily changed over, allows for the broaching of several different parts.

This machine is another example of how American can help you obtain high production with low unit cost. If you have a metal-removing problem, just send a part print and sample for a free estimate.

American *engineers and builds all three*—broaching machines, broaches and broaching fixtures.

Write today for free literature.

American BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

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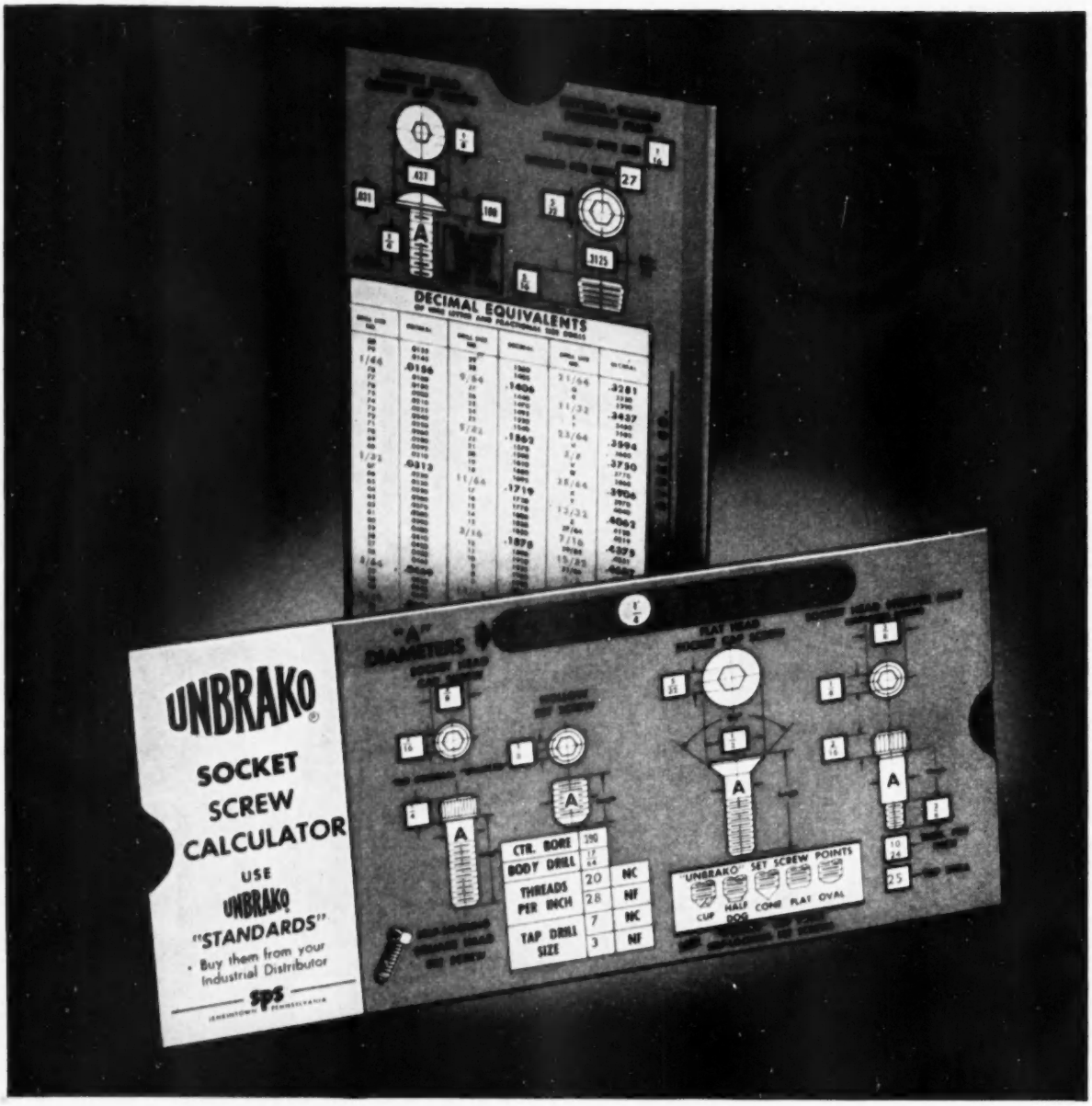

Our New UNBRAKO Socket Screw Calculator—YOURS FOR THE ASKING

This handy pocket-sized slide-rule type socket screw calculator gives diameters, lengths, socket dimensions, threads and drill sizes—in fact, everything you want to know when using UNBRAKO socket screw products. And it's free.

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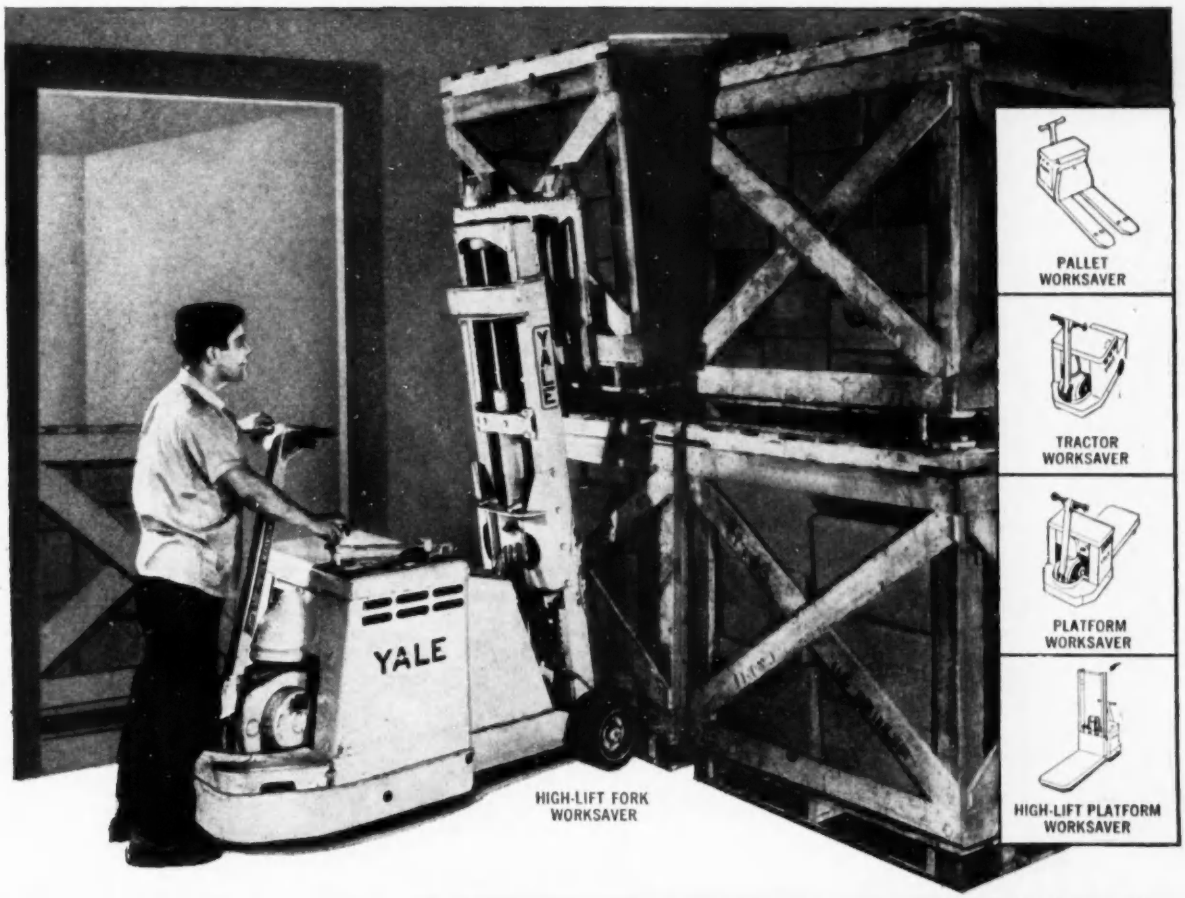

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The Only Performance-Proven Low Pedal Power Brake

Car manufacturers, here is a sure answer to the problem of creating added interest in your line of cars. Equip your vehicles with Bendix* Low Pedal Power Brake, the sales feature that has already established itself as one of the most popular devices offered the public in years.

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Remember, too, this new low pedal power brake is the product of Bendix, world's largest producer of power brakes and leader in braking developments since the earliest days of the industry. That's why if you are contemplating power braking it will pay to "Sign Up" with Bendix for the greatest improvement in braking since four wheel brakes. *REG. U.S. PAT. OFF.

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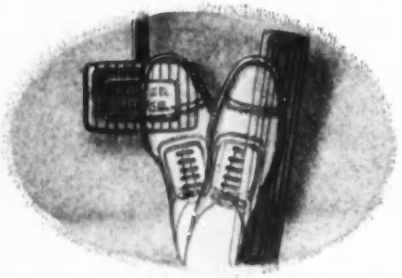

It is no longer necessary to lift the foot and exert leg power pressure to bring your car to a stop. With the Bendix Low Pedal Power Brake on about the same level as the accelerator, an easy ankle movement, much like working the accelerator, is all the physical effort required for braking. And by merely pivoting the foot on the heel, shifts from "go" to "stop" controls are made in far less time.

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High Spots of This Issue

★ Engineering Preview of Indianapolis

Interest in this year's 500-mile Memorial Day race is already keyed to fever pitch over some of the unusual features of several entries. More speed, power, and endurance promise to make it one of the best contests yet. Page 49.

★ Latest Advances in Combustion Chamber Design

The achievement of the higher compression ratios found in today's passenger car engines has been largely due to improved combustion chamber design. The author reviews here the features of various types now in use. See Page 54.

★ "Production Tomorrow"—Theme of SAE Meeting

In the spotlight at the recent SAE Annual Production Forum in Cleveland were new plant developments, machines, and methods. Coupled with talk about future manufacturing practices, however, was interest in present problems. Page 62.

★ The Ideal Automatic Transmission

Although marked advances in design have been made, no automatic transmission now in use has reached perfection. The reasons are explained here, and an outline of the requirements which an "Idealomatic" must meet is given. Page 66.

★ Greater Automaticity in Tooling for J-47 Engines

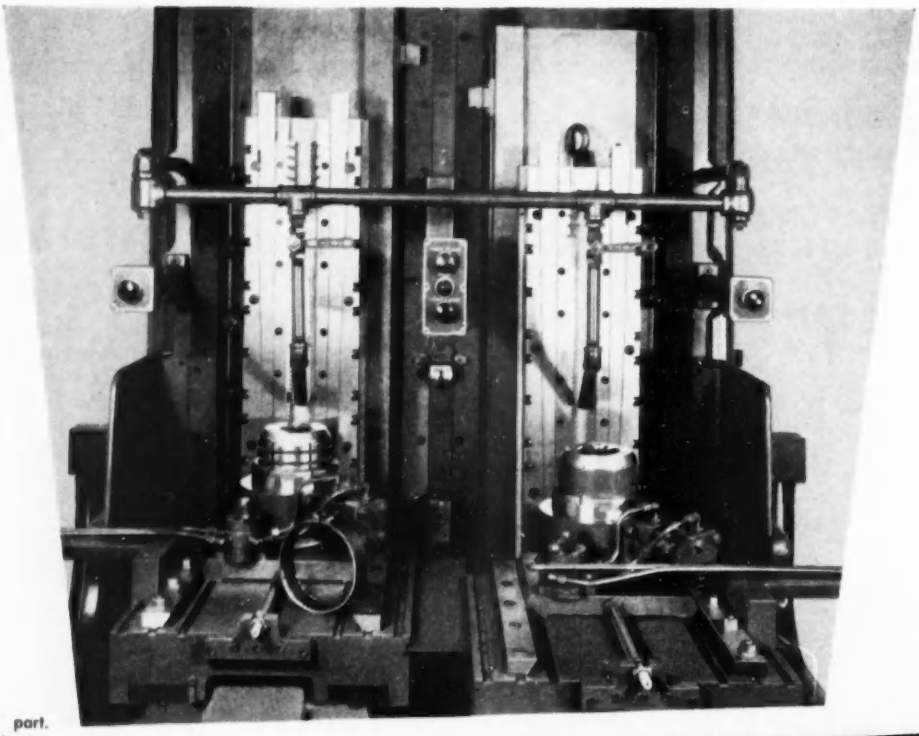
Production of J-47 turbojet engines is going ahead at the huge Evendale, O., plant of General Electric Co. with the latest machine tools and methods. Featured in this article is the manufacture of compressor stator sections. Page 68.

★ 21 New Product Items And Other High Spots, Such As:

Victory isn't here yet—the game isn't over (editorial); brake disks deburred on special fixtures in rotating barrels; special device tests for leakage in valve seating; new Reo Gold Comet engine develops 160 hp; gear shaper cuts production time; and annual reports at a glance.

Automotive and Aviation News, Page 33
Complete Table of Contents, Page 3

AUTOMOTIVE INDUSTRIES COVERS
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES
• BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY •
PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT
SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
ENGINEERING • PRODUCTION • MANAGEMENT



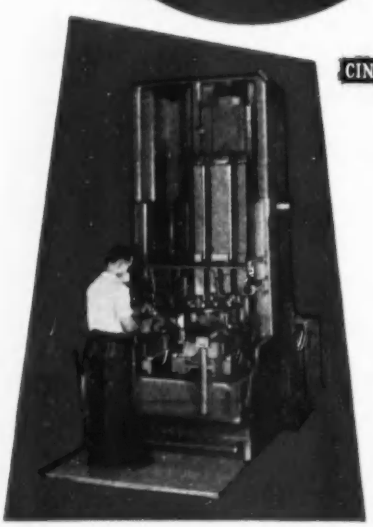
Drawing of part. Solid area indicates material removed.

BROACHING THE EARS On Transmission Band Assembly

CINCINNATI Duplex Hydro-Broach tooled up to broach transmission band assembly

Material	Steel
Operation	Broach 41° angular grooves
Stock removal	From solid
Production	283 per hour
Equipment	CINCINNATI Duplex Vertical Hydro-Broach Machine

You probably have been stymied more than once by machining operations on thin fragile parts. How one part of this type was taken out of the headache class and set up in a smooth, low-cost production schedule is illustrated here. It shows a CINCINNATI Duplex Vertical Hydro-Broach Machine, tooled up to broach the ears on transmission band assemblies. ¶There are two hydraulically operated, manually controlled fixtures, one for each ram. While the part in one station is being broached, the operator reloads the other fixture. He can take as much time as necessary because the rams do not go through their cycle until the pre-set cycle buttons are pressed (a CINCINNATI safety feature). Other CINCINNATI advantages for low-cost broaching operations include hardened and ground ways... automatic way lubrication, with manual flushing lever... dove-tail clamp arrangement for interchangeability of broach holders and cutting tools as a unit. Principal features and specifications are outlined in Sweet's Machine Tool Catalog. If you would like to have complete data, write for publication No. M-1709-1.



CINCINNATI No. 10-66 Duplex Vertical Hydro-Broach. Catalog No. M-1709-1 contains complete specifications. Write for a copy.

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News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 108, No. 9 **May 1, 1953**

Supreme Court Upholds Vet Seniority Clause

The U. S. Supreme Court has upheld the validity of the veterans seniority clause in the contract between Ford Motor Co. and the UAW-CIO. The ruling in the case, which was unique in that it found company and union joining to fight a suit by a group of workers, is of far reaching importance. An adverse decision might have paved the way for millions of dollars in lawsuits against all automobile companies which have similar provisions.

The dispute stemmed from a provision giving seniority credit for the entire World War II period to veterans hired by Ford for the first time at the end of the war. Workers hired by the company during the war and later drafted attacked the seniority clause as discriminatory, since they received credit only from the time they first started working for the company instead of for all of the war years. The court ruled that collective bargaining agreements under which an employer gives credit for pre-employment military service are valid.

National Auto Show Plans Upset Again

Once again plans for a national automobile show staged by the manufacturers have gone glimmering. Up until recently chances for a revival of a national show were considered extremely good.

However, when the companies discussed the situation, the consensus of opinion was that suitable facilities were not available in New York for the kind of show the industry contemplates, and there was little interest in seeking adequate space elsewhere. There had been some opinions that the show might be rotated from city to city in subsequent years, but that idea, too, fell by the wayside.

TOUR OR COMPETE

The Sunbeam - Talbot Alpine sports car delivers for $2999 in New York City. Four-cyl ohv engine gives 80 hp at 4200 rpm. from 138 cu in. at 7.42:1. Options include high - compression head and valves, ignition, overdrive (fifth gear).

Ford May Absorb Dearborn Motors

Reliable reports say that Ford Motor Co. will take over ownership of Dearborn Motors Corp. later this year. Dearborn Motors was formed in November, 1946, as the national marketing organization for the Ford tractor. Since that time it has taken on an extensive line of farm equipment and has acquired a farm implement company in Iowa.

A definitive breakdown of stock ownership in the company has never been revealed, but it is known to include several Ford officials. The exact date of the acquisition by Ford, or the reasons behind it, have not been divulged.

GM "Parade of Progress" Revived; Goes on Road

General Motors has revived its "Parade of Progress" traveling exhibition, originally started in 1936 and suspended at the start of World War II. The research and engineering educational show has been completely revamped with new equipment, exhibits, and stage presentation. A nation-wide tour started in Detroit April 14 and will be on the road indefinitely.

The show will open officially in Dayton, O., on May 12 after preliminary previews at Lexington and Frankfort, Ky. It will then tour through 19 other cities in Ohio, Indiana, Michigan, Pennsylvania, Delaware and Maryland this year. A tour of southern states will follow during early next year.

Start Assembly Plant

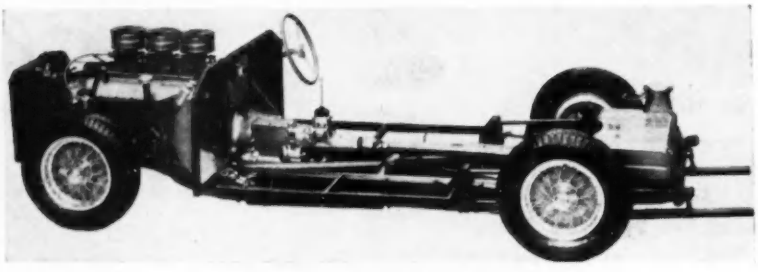
The first car will roll off the assembly line at the new Ford Motor Co. of Canada plant near Toronto, Ont., on May 11, J. M. Cochrane, vice-president of the plant, announced.

No actual manufacturing will be done in the new plant. The vehicle assembly line and allied operations are being moved to Oakville with the manufacturing still to be done in Windsor. Paint spray booths and ovens will start working early in May, and the assembling of the car bodies started April 27. In the beginning the assembly line will be running at about one-third of its capacity and it will be early fall before full-time production is in progress.

News of the AUTOMOTIVE

Chevrolet to Build Engineering Center

Chevrolet is planning to build an engineering center at the General Motors Technical Center in suburban Detroit. It will consist of three adjoining buildings with about 500,000 sq ft of space and will include an administration building, experimental shop, and laboratory. It will bring together for the first time the complete Chevrolet Engineering Department, which currently is scattered among six different locations in Detroit.



FERRARI V-12 CHASSIS

A successful combination in world competition is this Ferrari V-12 seven bearing engine on the 212 Inter chassis. The 156 cu in. engine develops 170 hp at 6500 rpm at 8:1 compression ratio. Frame is eliptic pipe. Rear axle is fixed, front is independent with transverse spring. Five-speed box is direct in fourth. Wheelbarrow is 102 in.

Two Makers Set to Adopt Monroe Power Steering

It is reported that two passenger car producers will adopt the Monroe power steering system (AUTOMOTIVE INDUSTRIES, March 1, p. 47) and that others are interested. In addition, an accessory package will reportedly be marketed to fit existing Ford, Lincoln, Mercury, Buick, Oldsmobile, Cadillac, Pontias, and Packard models going back to 1949. It would be installed by dealers and is priced at from $225 to $250, plus installation charges (estimated at from $20 to $25).

One of the larger automobile companies has a new power steering unit under development which should be along within a few months. Furthermore, Ford and Mercury soon will offer power steering, and it would not be surprising before the year is out to see nearly all makes offering it as optional equipment.

Cooling Unit Ready for Chrysler Eights

Chrysler Div. now has its air-conditioning system available on all eight-cyl Chrysler cars except the Crown Imperial. It will be made available on six-cyl models later when the supply is adequate. Price of the system installed at the factory is $595, plus federal tax.

Rotunda to Reopen

Ford Motor Co. expects to play host to three-quarters of a million people in its 50th anniversary year. More than 250,000 visitors will tour the Rouge plant at Dearborn, Mich., or one of 18 branch assembly plants in 1953. An additional 500,000 will see the Ford Rotunda at Dearborn. The Rotunda, closed in World War II, will be reopened June 6.

Labor Woes, Sales Outlook Cloud Auto Scene

Labor trouble seems to have taken the play away from material shortages as the deciding factor in whether or not the automobile industry will reach its production goals for the present quarter. Schedules have been hiked again to 1.9 million units with the material in sight to attain that objective if the labor pot can be kept from boiling over too often.

A rash of "quickie" strikes and the more serious several-day stoppage at Ford's Monroe, Mich., plant may be only a temporary insurgence or might be a symptom of more trouble to come. However, if the labor situation can be smoothed out a bit the industry is well on its way to a record first-half production of approximately 4.4 million passenger cars.

Any concern about sales keeping up with the flood of new cars coming from factories is centered on conditions later this year. Dealer stocks are building up to some extent, but the current selling season is absorbing them fast enough to keep the inventories from getting top heavy.

Nonetheless, some factory sales officials are taking an uneasy look at July, August, and September. They are wondering whether retail deliveries will support the kind of production schedules now contemplated.

The factor that is disturbing some sales departments is the high level of outstanding consumer credit on automobiles. There is some trepidation that credit policies may have been a little too generous for the good of the industry's future.

In addition, there have been veiled hints from Government officials that unless sellers take some action to curb credit, the Government may again step in. Finance companies also are tightening up, so there is a possibility that credit sales may run into some financing trouble about the same time that the normal seasonal demand tapers off.

One condition that is different now from pre-war is that dealers are more vocal and organized in their protests against taking unordered merchandise. While the factories still have a certain amount of "moral suasion" at their command, they also are conscious of anti-trust and other possible Government interferences if they put on too much pressure.

The market looks healthy enough to absorb a large number of cars this year. Whether or not it will take all that the factories are producing at the current rate is open to some doubt.

AND AVIATION INDUSTRIES

Navy Cancels Ford $154 Million Jet Program Air Force Cuts Studebaker, Packard Orders

In line with a program shaping up in the Defense Dept. to concentrate work in the hands of prime contractors for more economical production, the Navy recently terminated its $154 million contract with Ford for J-40 jet engines. It was cancelled three months ahead of the scheduled start of production because of "changes in requirements."

There is considerable speculation about the fate of the new 500,000 sq ft plant which Ford is building for the Navy at Romulus, Mich., where the jet engine job was to be centered. One source says the Navy will complete the plant and retain it as an industrial reserve unit. However, there is some thought that perhaps Ford might buy the plant for its own purposes.

Concellation of the contract will free up about 225,000 sq ft of floor space now being used for work on J-40 subassemblies at the new Lincoln-Mercury plant at Wayne, Mich. It also will make available about 600 salaried employees and 75 hourly rated workers for other jobs, an important consideration in view of the critical shortage of workers in the Detroit area.

Machine tools already completed, or on order, for the jet job will be stored in the new Romulus plant, if not required in other defense work. Production equipment now being used at the Wayne plant also will be stored at the Romulus unit.

Jet Cutbacks Also

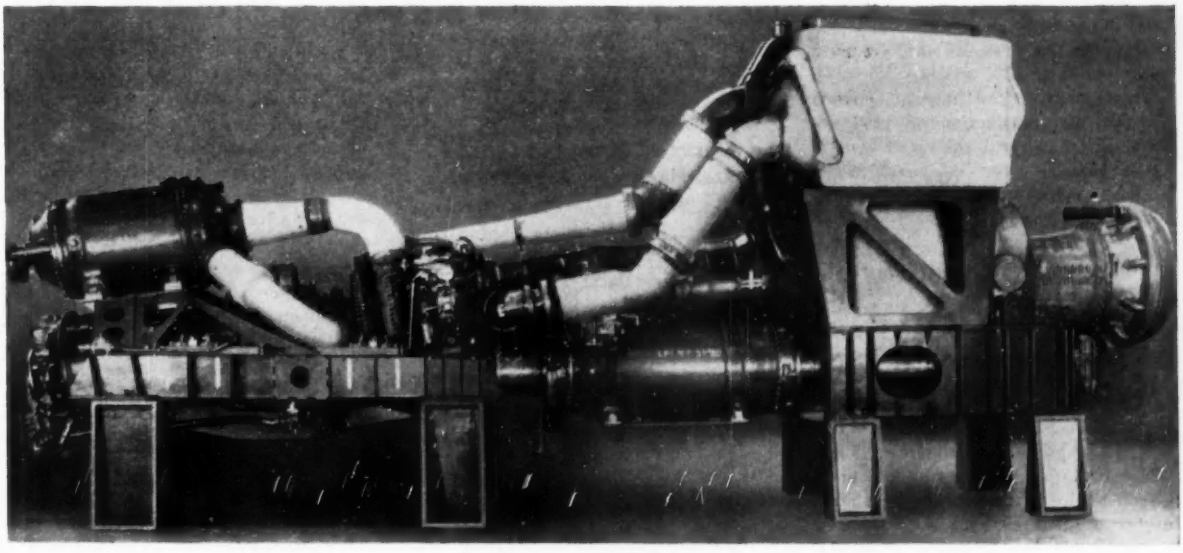
At about the same time the Navy cancelled the Ford contract, the Air Force reduced its orders for J-47 jet engines with Packard and Studebaker by $100 million. Indications are that both companies will finish their contracts sometime next year.

The Air Force stated that the cutback was made because engine life is twice that originally estimated, thus reducing the total number of engines required. In addition, the production program for the J-47 at General Electric plants at Evandale, O., and Lynn, Mass., is being stretched over a longer period, although the total size of the contract is not being reduced at present.

Chevrolet Expanding Powerglide Output

Chevrolet is greatly expanding its facilities to produce automatic transmissions at its Cleveland plant. Two assembly lines are producing the Powerglide now on a two-shift, six-day-a-week basis, and output is constantly being expanded. The expansion program will be completed during the balance of this year.

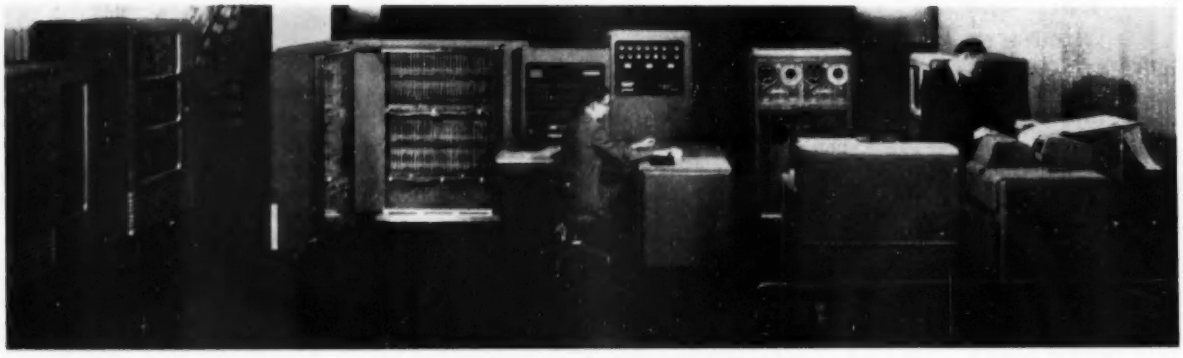
Current production is at the rate of about 35,000 units a month, which is far below demand. Chevrolet built 1,034,989 Powerglide transmissions of the original design before going into production of the current model, which was new with 1953 models.



SEAGOING GAS TURBINE

Two of these Rolls-Royce gas turbine engines replace two 4000-hp steam turbines of twice the weight. High compression ratio provides economical low-power cruising. Low pressure compressure delivers air through intercooler to two-stage centrifugal compressor, through exhaust heat exchanger to combustion chambers. Heated air drives three independent turbines; high-pressure turbine drives high-pressure compressor, power turbine drives propeller through two-stage reduction gear, and low pressure turbine drives low-pressure compressor. This and a larger Metropolitan Vickers turbine are reported to be on order by the U. S. Navy.

News of the AUTOMOTIVE



RAPID PROBLEM SOLVER AVAILABLE

Engineering problems never before tackled, or those which previously took months by hand methods, can be solved in minutes on the new IBM 701 data processing machine. This first production model in the firm's headquarters is for rent by the hour to solve partial differential equations, matrices, integral equations; a typical problem in wing design requires eight million calculating steps per case. IBM is educating industry to its usefulness, will teach programming free. A dozen or more machines will be built this year for government agencies and defense industries. Units from left are magnetic drum and electrostatic storage units, control unit and card reader, tape readers and recorders, page printer and card punch. Two machines will be installed at Douglas Aircraft this year at $15,000 per month rental. Sixty mathematicians will be employed directly or indirectly to handle them.

Cadillac Makes Big Cut in Tank Costs

Another instance of how mass production and automotive engineering skill reduce cost is the large reduction in the price of tanks now being produced by Cadillac at Cleveland. Originally, the price was $330,000 apiece for the first 350 tanks turned out.

Current price for the unit now is $77,000, or a reduction of $253,000. In addition, several thousand specification changes have been made in the tank since production started nearly two years ago.

Arizona Track Opened

General Motors Corp. formally dedicated its 2280-acre Desert Proving Ground 35 miles southeast of Phoenix, Ariz, last week.

"One of the major continuing tests we will conduct on the desert ground will be of air conditioning units for our cars," said C. A. Chayne, vice-president in charge of the engineering staff. Installations at the desert ground include a five-mile circular track, with its outer lane banked; 1½-mile engineering straightaway inside the track; a cement block shed without roof, adjacent to the track; an operations building which includes offices, garage and filling station, and a care-taker's house with living quarters for visiting engineers.

The track will be used for high and low speed testing, one of the main projects being the observation of engine and oil cooling systems at sustained high speeds. Acceleration and deceleration tests will be held on the straightaway. The roofless cement block shed, adjoining the track, will be used for the study of vapor lock.

Chrysler Moves Ordnance Development Department

Chrysler has moved the Ordnance Development Dept. of its Engineering Division to new headquarters in the new Chrysler Parts Plant at Centerline, Mich. In its new quarters the department will have three times as much floor space as was previously available and will be advantageously located near the Chrysler Detroit Tank Plant.

Pioneer Pump Div. Moves to Kentucky

Manufacturing operations of the Pioneer Pump Div. of Detroit Harvester Co. have been transferred from Detroit to Paris, Ky. Production of standard models of industrial pumps already has been established at the 100,000 sq ft plant.

Tubeless Truck Tires Under Development

Tubeless tires for trucks are getting some consideration by truck builders. Firestone already has announced such a unit and is supplying some of the truck builders with tires for test.

Engineers believe adoption of tubeless truck tires will have to come as a factory installation. Since special wheel and rim are required, the cost of a changeover by a fleet operator appears rather prohibitive.

It is claimed that the tires have distinct advantages, including ease of mounting, and weight savings of about 200 lb on a six-tire rig. Other tire companies are working on the development, but adoption of the tubeless truck tire by the industry probably will not come until there are several sources of supply.

Tire Makers Using More Crude Rubber

Tire makers are using more natural rubber as the price of the crude product continues to decline. Percentage used now is estimated at 40 per cent, compared with 36 per cent a year ago. Natural rubber, now at 21.5¢ a pound, is cheaper than synthetic rubber for the first time since the start of the Korean war.

AND AVIATION INDUSTRIES

Future for Six Seen by Ford Man

In a session of more than local significance, V. G. Raviolo, Ford Motor Co., covered the entire gamut of future engine development at a meeting of Detroit Section of SAE held in Toledo in April.

The speaker feels that the industry is now emerging from a new tooling phase which occurs at almost regular intervals, and that it has just about reached its peak in aiming for horsepower. From now on, he said, we may expect greater effort at improving fuel economy. Compression ratio is on the way up, paced by developments in the fuel picture. If it is reasonable to expect 100-octane fuels by 1960 then compression ratio may rise as high as 10 to 1 by that time.

There is a definite trend to higher bore/stroke ratios, implying larger bores, larger valves, better breathing, larger parts such as main bearings and crankshafts. Improvements in the future will be concerned with effecting these changes without increasing engine weight per cu in. displacement.

Mr. Raviolo emphasized that although the general trend is to overhead valve V-8's with L-head engines going out of the picture, there is a definite place for the Inline Six. The latter has the advantage of low manufacturing cost, compactness, and simplicity of design and is very much in the picture so far as Ford planning is concerned.

Although V-6's and flat sixes have attracted considerable attention they offer little advantage over the V-8 from the standpoint of cost and could be considered only in the event of unorthodox chassis design, as is the case of European cars.

Injection Coming

With further development there will be economic justification for fuel injection on passenger car engines, he said. LPG, now making headway on truck engines, is a sound development in this field, and provides the greatest advantage from the standpoint of increased engine life through clean burning of the fuel. Gas turbines must be reckoned with in passenger cars of the future. However, the speaker believes that commercial exploitation is about 15 years away.

Raviolo sees a widening horizon for applications of plastics and aluminum for covers and certain nonstructural parts. In the case of aluminum, specifically, he believes there is real merit in the brazed sandwich parts developments at Alcoa and visualizes widening adoption of certain major parts made by this process, although he does not forecast an all-aluminum engine in the near future.

Mobilgas Honors Go to Ford Six

Here are first-place results of the AAA - Mobilgas Economy Run last week over the 1206.1-mile route for 1953:

Class A ($1500 - 2050, std or o'drive); Ford six-cyl, 56.7028 ton-mpg, 27.0335 mpg. Class B ($1500-2050, automatic); Hudson Jet, 42.4606 ton-mpg, 22.0575 mpg. Class C ($2051-2500, std or o'drive); Dodge eight-cyl, 52.8565 ton-mpg, 23.4189 mpg. Class D ($2051-2500, automatic); Studebaker Land Cruiser, 49.3476 ton-mpg, 22.8885 mpg. Class E ($2501-3000, std or o'drive); Nash Ambassador, 51.3140 ton-mpg, 22.5451 mpg. Class F ($2501-3000, automatic); Nash Ambassador custom, 48.9051 ton-mpg, 21.1156 mpg. Class G ($3001-4000, automatic); Lincoln Capri, 52.3467 ton-mpg, 19.9416 mpg. Special lightweight class; Henry J four-cyl, 48.5768 ton-mpg, 28.2587 mpg.

Overall average speed was 44.7 mph and overall average fuel economy was 22.2869 mpg.

Deluxe Model Cars Enjoy High Demand

Despite opinions to the contrary, the public in a free market apparently prefers deluxe model automobiles over stripped-down or standard models by a wide margin. For example, Pontiac reports that when its new models were introduced last December, the ratio of deluxe to special models was 12 to 1, and that currently it is running nearly 15 to 1 in favor of the deluxe cars. Other companies report similar preferences.

1953 NEW PASSENGER CAR REGISTRATIONS*

Arranged by Makes in Descending Order According to the 1953 Two Months' Totals

MAKE	February 1953	January 1953	February 1952	TWO MONTHS Units 1953	Units 1952	Per Cent of Total 1953	Per Cent of Total 1952
Chevrolet	89,831	69,933	68,009	159,764	132,799	20.42	22.26
Ford	69,922	76,617	40,028	146,539	79,843	18.72	13.38
Plymouth	41,235	47,002	33,841	88,237	74,219	11.27	12.43
Buick	34,680	26,102	23,821	60,782	47,319	7.76	7.93
Pontiac	26,103	26,845	17,685	52,948	40,047	6.76	6.71
Oldsmobile	23,722	18,798	16,566	42,520	32,397	5.43	5.43
Dodge	20,638	21,604	17,236	42,242	33,603	5.40	5.63
Mercury	17,745	19,831	11,960	37,576	24,259	4.80	4.06
Nash	12,568	12,763	9,662	25,351	18,655	3.24	3.13
Chrysler	11,076	11,702	9,177	22,778	18,701	2.91	3.13
Studebaker	7,514	11,704	15,690	19,218	30,569	2.46	5.12
De Soto	6,344	9,356	6,523	17,700	13,122	2.26	2.20
Cadillac	8,583	8,118	6,364	16,701	10,837	2.13	1.82
Packard	6,654	6,450	4,423	13,104	8,832	1.67	1.48
Hudson	4,700	5,316	5,845	10,016	10,944	1.28	1.83
Willys	4,483	4,416	2,186	8,899	3,938	1.14	.66
Lincoln	2,507	2,929	1,214	5,436	2,156	.69	.36
Kaiser	2,211	2,621	2,694	4,832	5,502	.62	.92
Henry J	1,144	1,302	1,979	2,446	4,305	.31	.72
MG (British)	613	583	398	1,196	765	.15	.13
Ford (British)	401	467	274	868	579	.11	.10
Hillman (British)	434	363	250	797	524	.10	.09
Austin (British)	326	342	388	668	794	.09	.13
Jaguar (British)	284	384	177	648	360	.08	.06
Allstate	72	66	136	138	196	.02	.03
Misc. Domestic	199	85	672	284	981	.04	.16
Misc. Foreign	549	542	281	1,091	612	.14	.10
Total—All Makes	396,558	386,221	296,479	782,779	596,858	100.00	100.00

* Based on data from R. L. Polk & Co.

News of the AUTOMOTIVE

WING STRESS

This double exposure of right wing of Douglas C-124 shows the 12-ft deflection on static test. Forces at 65 points were equalized according to normal flight stresses.

Ford of Canada Sales Set High

Ford Motor Co. of Canada, Ltd., reports a net profit of more than $15.3 million last year on record sales in excess of $267.68 million. Sales were up 5.8 per cent over the previous year, and production also was at an all-time high of 132,190 vehicles, an increase of 13,334 over 1951.

The company this year is continuing its expansion program and expects to spend nearly $67 million on expansion and modernization. After transfer of assembly operations from the present Windsor plant to Oakville about mid-year, the former will be converted into a modern engine plant. Important changes also will be made in the foundry and machine shop there.

Truckstell Cuts Prices

A stepped-up sales campaign has been announced for dual-axle drives by the Truckstell Mfg. Co. Innovations are included in the program are: installation of the dual-drive to the truck chassis in Truckstell assembly plants at Detroit, Mich., and Townsend, Mass., delivery by factory driveway, increased dealer profits and lower prices.

Arrowhead Builds

Arrowhead Rubber Co., division of National Motor Bearing Co., Inc., announces the addition of 20,000 sq ft of floor space to its plant in Long Beach, Calif., to meet the increasing demand for the company's products and in anticipation of broadening markets for the company's line of flexible Airtron ducting, sleeves and couplings fabricated of rubber impregnated fiberglass cloth and the new Arcosil silicone ducting, sleeves and couplings.

Brill Ambulance

Specially-designed ambulances, with interior appointments duplicating the interiors of air evacuation planes, will be built for the Air Force by the ACF-Brill Motors Co. An order for eleven of the new ambulances has been placed. Delivery will start this month. The 18,000-lb ambulances are 35 ft long, with wide rear doors installed.

General Tire Develops Air Spring Suspension

General Tire & Rubber Co. has announced an air spring suspension system. It is now being made available to vehicle and suspension manufacturers for design into complete suspensions.

The unit currently is being used on a tandem axle trailer but can be adapted to single-axle semi-trailers or truck suspensions. It consists principally of a fabric and rubber bellows which operates under air pressure. This can be regulated by valving to maintain body height under varying load conditions and to vary the springing action for various type cargoes.

REGIONAL SALES OF NEW PASSENGER CARS

Zone	Region	February 1953	January 1953	February 1952	Two Months 1953	Two Months 1952	Per Cent Change: Feb. over January	Feb. over Feb. 1952	Two Months 1953 over 1952
1	New England	20,501	20,350	15,791	40,851	31,668	+ .74	+29.83	+29.00
2	Middle Atlantic	79,993	60,865	50,968	140,858	103,100	+31.43	+56.93	+36.62
3	South Atlantic	43,933	48,705	35,876	92,638	78,288	- 9.80	+22.46	+18.33
4	East North Central	99,076	101,709	78,384	200,785	153,221	- 2.59	+26.40	+31.04
5	East South Central	20,233	19,232	13,622	39,465	28,504	+ 5.20	+48.53	+38.45
6	West North Central	36,806	32,169	28,734	68,975	61,119	+14.41	+28.09	+12.85
7	West South Central	39,319	44,158	30,459	83,477	59,994	-10.96	+29.09	+39.14
8	Mountain	12,526	13,082	10,060	25,608	19,015	- 4.25	+24.51	+34.67
9	Pacific	44,171	45,951	31,585	90,122	61,949	- 3.87	+39.85	+45.48
	Total—United States	396,358	386,221	295,479	782,779	596,858	+ 2.68	+34.21	+31.15

States comprising the various regions are:—Zone 1; Conn., Me., Mass., N. H., R. I., Vt.—Zone 2; N. J., N. Y., Pa.—Zone 3; Del., D. of C., Fla., Ga., Md., N. C., S. C., Va., W. Va.—Zone 4; Ill., Ind., Mich., Ohio, Wis.—Zone 5; Ala., Ky., Miss., Tenn.—Zone 6; Iowa, Kan., Minn., Mo., N. D., S. D.—Zone 7; Ark., La., Okla., Tex.—Zone 8; Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo.—Zone 9; Cal., Ore., Wash.

AND AVIATION INDUSTRIES

Fruehauf Sees Boost in Truck Transport

A sharply accelerated growth in motor transport was the prediction recently by Roy Fruehauf, president of Fruehauf Trailer Co. Mr. Fruehauf said, "A 20 per cent increase in the total of trucks and trailers in service on America's highways by 1956 now seems fairly certain. Today there are 9,981,000 trucks and trailers in use—by 1956 the total should top 12 million. And the day is not too far away when trailers, both big and soon-to-be-developed smaller units, may comprise at least 35 per cent of the nation's trucking fleet.

"There are three big reasons for this expected growth—not the least of which is the fact that (President) Eisenhower is really trucking conscious. The nation's ever-expanding suburbanization and the increasing emphasis of retail stores on smaller inventories for 'quick turnover' are two other important growth factors," he said.

Credit for Republic

Republic Aviation Corp. has arranged a $15 million line of credit with New York banks. It will run two years to Mar. 31, 1955.

The new credit will facilitate volume production of high-speed fighter-bombers such as the F-84G, and the newer sweptwing F-84F.

New Brake Plant

Ground was broken in March for a new Bendix-Westinghouse Automotive Air Brake Co. plant at Oklahoma City, Okla. The new building will contain office facilities, warehouse space for service parts, and a production set up for rebuilding air brake units.

Press Plant Begun

Curtiss-Wright Corp. announced the start of a new plant in Buffalo, N. Y., to house a giant Air Force hot extrusion press that will turn out airplane propeller blades.

The new plant, costing about $2 million is expected to be in operation by mid-1954.

1953 RETAIL CAR SALES BY PRICE GROUPS*

NUMBER OF CARS

	February				Two Months			
	1953		1952		1953		1952	
Price Group	Units†	% of Total	Units†	% of Total	Units†	% of Total	Units†	% of Total
Under $2,000	210,895	53.56	155,244	52.87	417,236	53.68	318,984	53.79
$2,001 to $2,500	111,433	28.29	91,338	31.11	216,427	27.84	204,691	34.52
$2,501 to $3,500	54,519	13.84	33,605	11.45	108,871	14.01	51,132	8.62
Over $3,500	16,992	4.31	13,416	4.57	34,778	4.47	18,209	3.07
Total	393,839	100.00	293,603	100.00	777,312	100.00	592,986	100.00

DOLLAR VOLUME OF SALES

	February				Two Months			
	1953		1952		1953		1952	
Price Group	Dollars	% of Total	Dollars	% of Total	Dollars	% of Total	Dollars	% of Total
Under $2,000	$378,642,418	44.65	$276,284,951	44.57	$751,192,114	45.02	$556,833,883	45.62
$2,001 to $2,500	250,880,788	29.58	203,706,815	32.86	484,786,746	29.06	453,862,748	37.19
$2,501 to $3,500	150,359,307	17.73	90,607,406	14.62	297,689,236	17.84	142,934,912	11.71
Over $3,500	68,149,302	8.04	49,272,983	7.95	134,734,836	8.08	66,912,089	5.48
Total	$848,031,815	100.00	$619,872,154	100.00	$1,668,402,932	100.00	$1,220,543,322	100.00

*—Calculated on basis of new car registrations, as reported by R. L. Polk & Co., in conjunction with advertised delivered price at factory of four door sedan or equivalent model. Does not include transportation charges or extra equipment.
†—New registrations of American made cars only. Does not include imported foreign cars.

Nankervis Expands

The George L. Nankervis Co., manufacturers of industrial testing equipment for the automobile and aircraft industries, announces the completion of its third expansion program in the past three years. The latest expansion includes a new manufacturing plant integrated with additional engineering facilities.

Located adjacent to the main facilities, the new one story plant provides over 10,000 sq ft of manufacturing space. New equipment in use at the plant includes: arc, heli-arc, and acetylene welding equipment, iron workers, nibblers, brakes, shears, punch and hydraulic presses and allied equipment. Engineering capacity of the company has been doubled, both in area and personnel.

1953 NEW TRUCK REGISTRATIONS*

Arranged by Makes in Descending Order According to the 1953 Two Months' Totals

				TWO MONTHS			
				Units		Per Cent of Total	
MAKE	February 1953	January 1953	February 1952	1953	1952	1953	1952
Chevrolet	24,817	25,174	19,536	49,991	38,991	35.40	32.79
Ford	15,936	18,328	13,205	34,264	26,191	24.26	22.02
International	7,685	7,737	6,680	15,422	13,530	10.92	11.37
Dodge	7,536	7,855	7,306	15,191	15,285	10.76	12.85
G. M. C.	6,498	7,068	5,971	13,566	11,940	9.61	10.04
Studebaker	2,105	2,210	2,137	4,315	4,251	3.06	3.57
Willys Truck	756	1,038	796	1,794	1,692	1.27	1.42
Willys Jeep	845	826	594	1,671	1,175	1.18	.99
White	835	780	795	1,615	1,772	1.14	1.50
Mack	390	490	528	880	1,064	.62	.89
Reo	283	283	236	566	475	.39	.40
Diamond T	227	247	292	474	560	.34	.48
Brockway	168	154	137	322	254	.23	.21
Divco	171	149	233	320	487	.23	.41
Autocar	126	95	147	221	289	.16	.24
Federal	76	127	57	203	109	.14	.09
Kenworth	50	52	70	102	117	.07	.10
F. W. D.	37	38	34	75	110	.05	.09
Pontiac	31	42	47	73	21	.05	.10
Peterbilt	4	21	28	25	45	.02	.04
Misc. Domestic	44	60	245	104	434	.07	.36
Misc. Foreign	16	32	14	48	34	.03	.03
Total—All Makes	68,616	72,606	59,285	141,222	118,948	100.00	100.00

* Based on data from R. L. Polk & Co.

Men in the News

Current Personnel Appointments and Changes at Plants of Automotive Manufacturers and Their Suppliers

Thompson Products, Inc. — John D. Wright has moved up to president, from vice-president and general manager. Frederick C. Crawford is now chairman, the position he held informally as president.

Cadillac Motor Car Div.—**Clarence J. Staufenbeil** is now national used car manager, and **J. P. Schaupner** will direct publications, customer relations, and special activities in the sales organization.

Ford Div., Ford Motor Co.—**Wendell S. Clough** will head a new styling liaison department, with **O. E. Peters** as supervisor of the styling analysis section and **E. R. O'Neill, Jr.,** as supervisor of the competitive products section.

Willard Storage Battery Co.—James E. Hatfield was recently named executive assistant, manufacturing, and Robert E. Gilks was appointed manager of the Cleveland plant.

Electric Furnace Co. —James V. Burrell will handle sales in the Michigan area.

Plymouth Div., Chrysler Corp. — Carl J. Demrick was promoted to the newly-created position of general manufacturing manager.

Firestone Tire & Rubber Co. — H. M. Taylor was elected vice-president, manufacturers sales recently.

Yale Lock and Hardware Div., Yale & Towne — Robert A. Dunlap fills the new post of automotive products sales manager, in Detroit.

Aluminum Co. of America — J. Howard Dunn succeeds Frank Jardine as manager of the Cleveland sales development and engineering division. Dunn is assisted by George L. Moore.

Greenlee Bros. & Co.—Donald E. Hawkinson is now sales manager of the special machine tools department. In the Detroit office, E. C. Van Tiem was named manager.

Marquardt Aircraft Co.—**Robert L. Goodyear** was named to head a new accessories engineering division. **John A. Drake** heads the engine and afterburner engineering division.

Willys-Overland Export Corp.—**Harry J. Kingsbury,** formerly with Rootes Group, Chrysler, and Ford, has been named director of general field operations in Europe, the Middle East, and North Africa. **Denton Massey,** general manager of European operations, will be technical director for Europe to work with Standard Motor Car Co., Ltd., London.

Lockheed Aircraft Corp.—**John F. Canady** is now corporate director of public relations, while **Don H. Cameron** is corporate director of industrial relations.

Willys-Overland Motors, Inc.—**Earl M. Muhleck** is now chassis engineer, and **C. I. Burdick** is director of industrial engineering.

Vanadium Corp. of America—**Dr. R. Genders,** British Government metallurgy research deputy director, has been retained as consultant.

Johns-Manville Corp.—**J. S. Doyle** is now staff manager for automotive sales.

Rosan, Inc.—**Brig. Gen. S. E. Ridderhof, USMC (ret.),** has joined as assistant to the president. **Robert D. Weber** is now director of engineering and **A. I. Lusk** is chief engineer. **Harry Bailey** and **Paul Winkler** are respectively vice-president and sales manager of the Thread Div.

Alloy Engineering & Casting Co.—**John R. McVeigh** was named chief engineer of Armed Services research and development projects.

Carboloy Dept.—**J. L. Greenens** has been appointed manufacturing superintendent of the **Edmore, Mich.,** plant.

Aviation Gas Turbine Div., General Electric—**H. J. Service** is manufacturing manager of the accessory turbine section.

Bardwell & McAlister, Inc.—**R. D. Hallock** has advanced to plant manager.

Raybestos-Manhattan, Inc. — **W. S. Simpson** was elected vice-president in charge of the Raybestos Div., and **M. A. Thompson** was appointed assistant comptroller of the corporation.

Pacific Airmotive Corp.—**Edward H. Farmer,** former Lockheed works manager, was elected vice-president — manufacturing.

Thompson Products, Inc. — **Tom Nicholson** has joined as Detroit district manager of the piston ring division.

Clark Equipment Co.—John A. Borman has returned as assistant to the vice-president of the Industrial Truck Div. Russell Hastings has joined the engineering staff.

Buda Co. — R. C. Wietersen, director of purchases, has been elected president of the Internal Combustion Engine Institute.

McKinnon Industries, Ltd., General Motors Corp. — Edwin H. Walker was raised to president, succeeding Thomas J. Cook, who retires after 28 years with GM.

Detroit Diesel Engine Div., General Motors — Recent engineering promotions raised **John Dickson** to chief of design and development, **J. A. Hall** to chief experimental engineer, **K. L. Hulsing** to chief application engineer, **T. E. Taylor** to administrative engineer, **V. C. Reddy** to development engineer, and **R. D. Wellington** to assistant director of the engineering laboratory.

Palmer-Bee Co.—**George H. LaPiner** is now advertising manager.

Gar Wood Industries—**C. B. Budinger** was recently appointed general manager of the subsidiary United Stove Co.

General Motors - Holden's Ltd. — **Earl C. Daum** succeeds **Harold E. Bettle** as managing director.

Ford Motor Co. of France—**Walter L. McKee** has been elected president, and **F. C. Reith** was named vice-president and general manager. McKee was formerly vice-president under Francois Lehideux.

Truckstell Mfg. Co. — Announcement of **William J. Reilly** and **Raymon L. Page** as vice-presidents in charge of manufacturing, and sales engineering, respectively, has been made.

Reo Motors Co. of Canada, Ltd.— **Richard Groom** has joined Reo as general sales manager.

Nash Motors of Canada, Ltd.— **John A. Mason** is now plant superintendent.

Motor Products Corp.—**Leonard A. Stewart** fills the new post of director of engineering of the Automotive Div.

Kaiser - Frazer Corp. — F. C. Stouffer is now general superintendent of the aircraft fabrication department.

AC Spark Plug Div. —Appointment of Robert H. Murphy as assistant production control manager has been announced.

Fruehauf Trailer Co.—**J. C. Scott** has become new product sales manager.

Bell Aircraft Corp.—Four new assistant vice-presidents are **J. F. Strickler, Jr.,** executive chief engineer. **H. H. Munsey,** patent counsel, **G. B. Clark,** director of helicopter contracts, and **J. W. Rane, Jr.,** director of contracts administration.

Rockwell Mfg. Corp. — **Albert G. Lindsey** is now manager of Export and International Divs.

Eaton Mfg. Co.—**Paul W. Knox** has joined the firm as steel purchasing agent.

Amgears, Inc.—**S. L. Cranshaw** has come to the firm as president and manager of Chicago operations.

Chrysler Corp.—**S. J. Crippen** has been named general superintendent, automotive production, Los Angeles plant.

Four Wheel Drive Auto Co.— **Charles E. Dexter, Jr.,** president of Liggett Spring & Axle Co., Monongahela, Pa., has been elected a director.

Maremont Automotive Products, Inc. — Arnold H. Maremont is now president, while Howard E. Wolfson has moved up to chairman of the board.

Tinnerman Products, Inc.—Ralph F. Merriam has been named director of purchases.

Necrology

John M. Macrae, manager of the Detroit office of Greenlee Bros. & Co., died Mar 12 at Rockford, Ill.

Camille Martinot - Lagarde, French aviation engineering pioneer, died in France on Mar. 28.

Charles P. Clark, 63, former treasurer of the American Trucking Association and former general manager of the American Automobile Association, died Apr. 3 in St. Louis, Mo.

George S. Hodges, 88, inventor, automobile body maker, and artist, died **Apr. 11** at his home near Pontiac, Mich.

Harry M. Carroll, 60, advertising manager of Hyatt Bearings Div. of General Motors Corp., died Apr. 20 at E. Orange, N. J.

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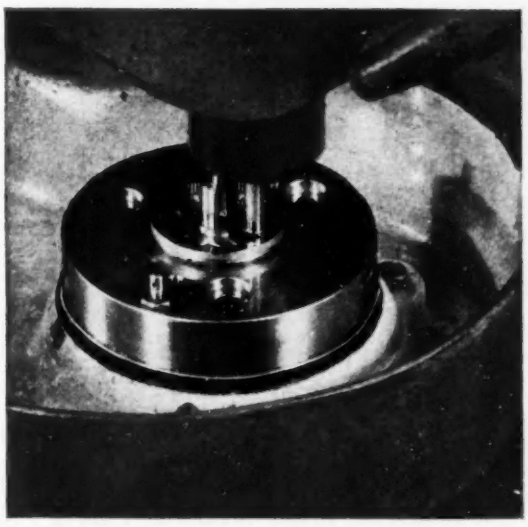

PRODUCTION DATA

Number of Teeth (Cutter) (Limited by projecting hub)	18
Number of Teeth (Gear)	96
Pitch	48
Pressure Angle	20°
Pitch Diameter	2.000 (+.002; −.000)
Run Out (Total Indicator Reading)	.001
Number of Cuts	2
Production Time (2 Cuts)	90 minutes
Blank Material	4140 Chrome Moly Steel

Control Instrument Company of Brooklyn, New York, uses a Fellows 7-Type Gear Shaper to cut this 2.000″ pitch diameter internal gear for a military fire-control device.

Using original Fellows cutters for both rough and finish cuts of this 4140 Chrome Moly steel, the number of rejects is exceedingly small. Control Instrument Company says, "... using Fellows cutters, our rejects are well under 1%."

The versatile Fellows 7-Type is the most widely used size in Fellows' complete line of Gear Shapers which generate gears from 1/16″ to 120″ diameter. It offers precision and high production on external gears up to 7″ diameter, 1½″ face and on internal gears up to 5½″ diameter, 1″ face. Set-up is simple, and changeover on production runs is quick.

For helpful information on cutting coarse or fine pitch gears, cams, ratchet teeth, interrupted profiles, segment gears, face gears, racks, and other unusual, high quality gears—just write, wire or 'phone the Fellows office nearest you.

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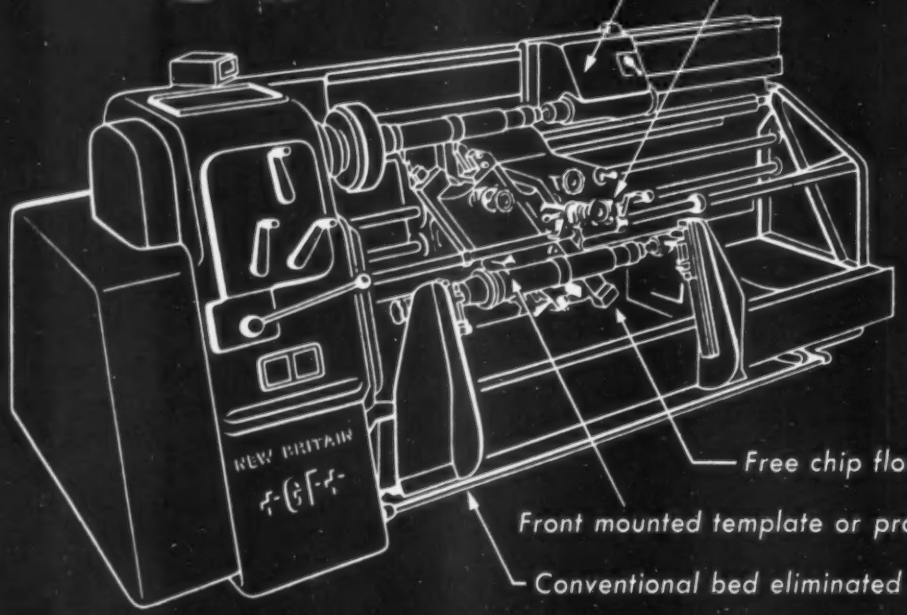

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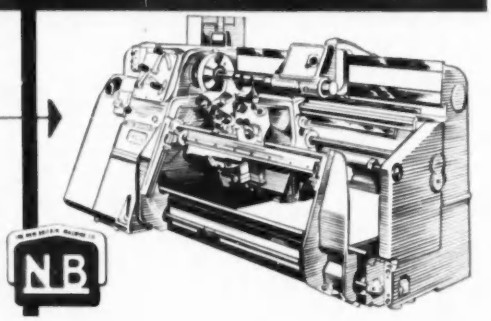

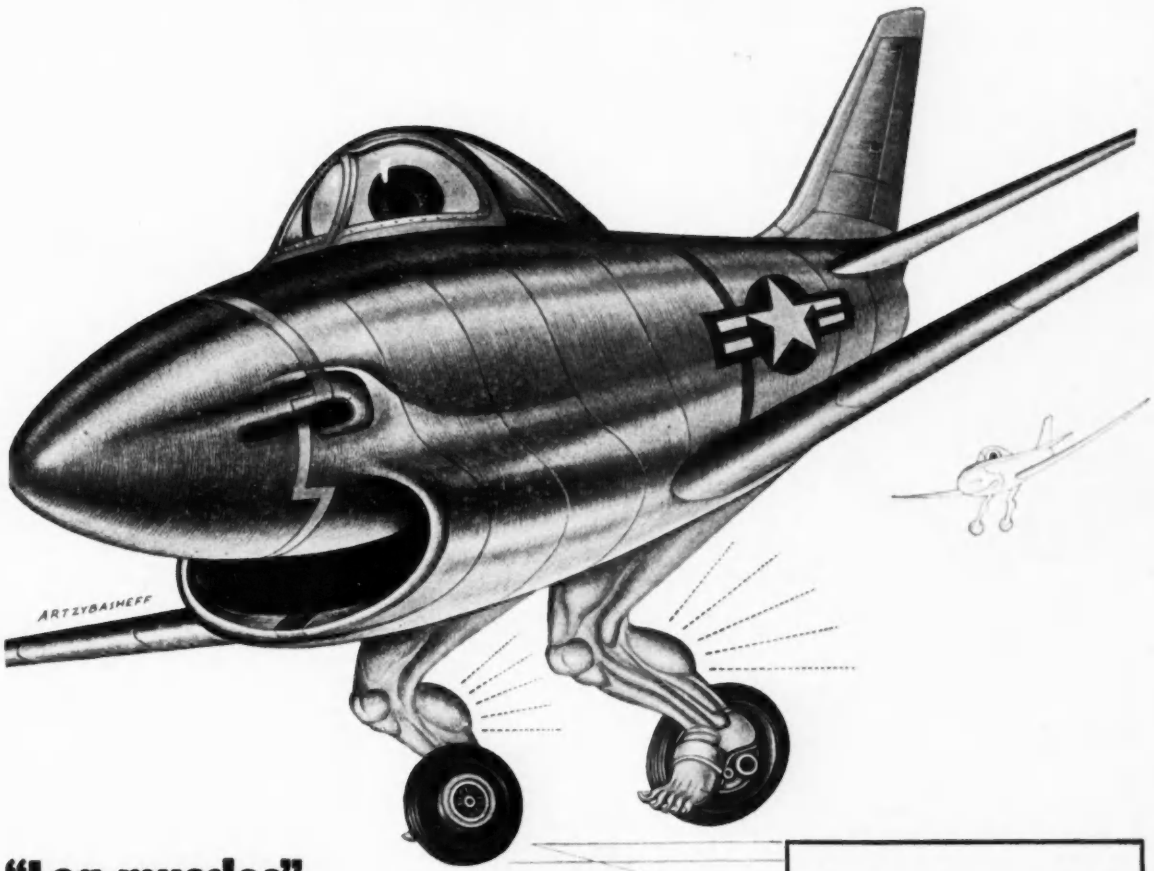

"Leg muscles" that cushion a jet's landing

When the landing gear of an F-86 Sabrejet hits the runway at lightning speed, the shock is absorbed by hydraulic action within the tough, precision-made cylinder on each "leg." To machine these 37-lb. cylinders to exact tolerances from solid 158-lb. steel forgings . . . to give them mirror-smooth inside finishes . . . Cleveland Pneumatic depends on Lycoming.

If *your* metal-working needs—like Cleveland Pneumatic's—can be solved by precision production, or if your problem is volume fabrication, or "just an idea" in the rough or blueprint stage—*look to Lycoming*. Long famous for metal-working skills, Lycoming meets the toughest specifications of exacting customers, both industrial and military.

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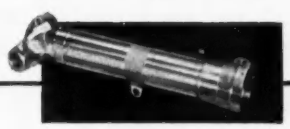
For main leg cylinders that enable a Sabrejet to absorb the jolt of high-speed landings—Cleveland Pneumatic looks to Lycoming's precision production



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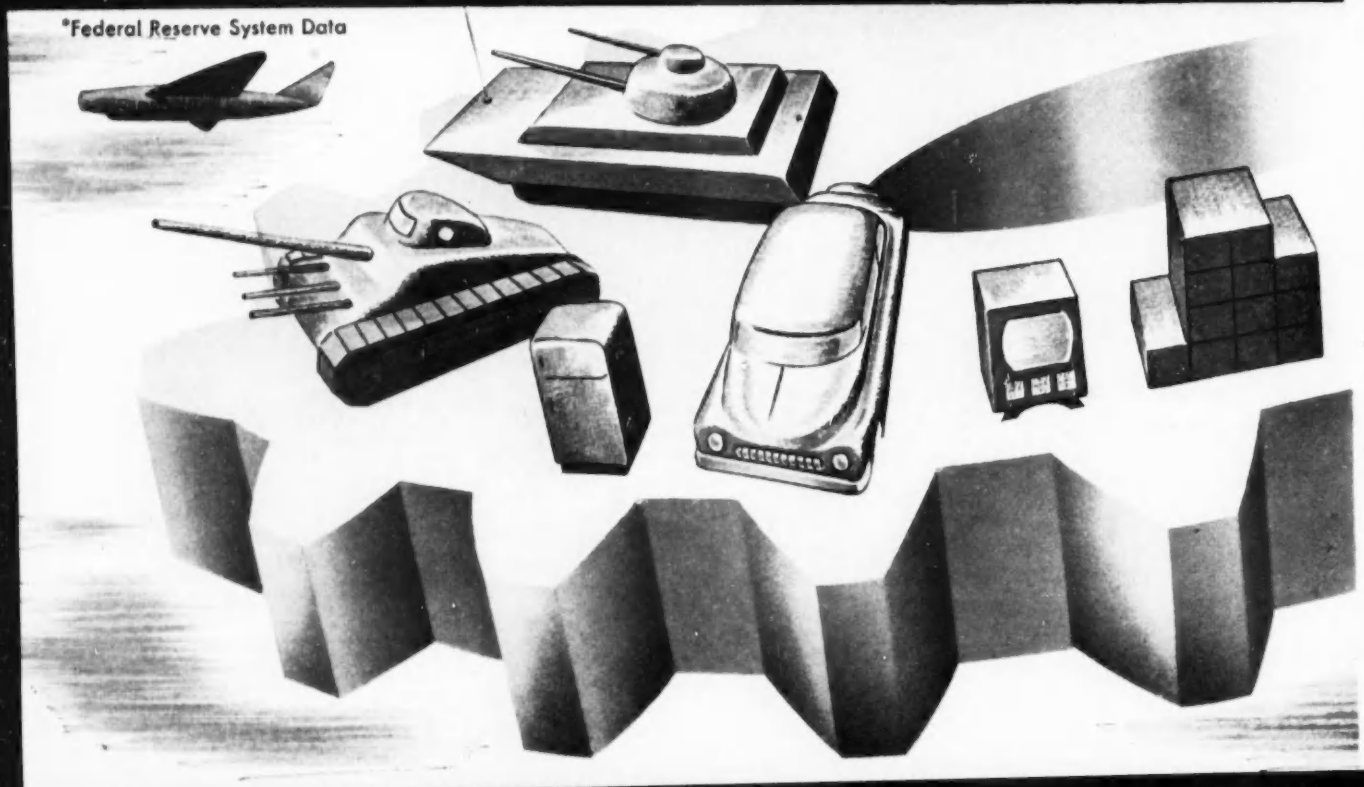
FOR USE WITH PRODUCTS PRODUCED

NATIONAL PRODUCTION GROWTH*

1944 1945 1946 1947 1948 1949 1950 1951 1952

*Federal Reserve System Data



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VICTORY ISN'T HERE YET

The Game Isn't Over

An Editorial

By James R. Custer

THE biggest game of all is taking place right here in America today. It isn't being played to cheering crowds in the stands, but rather to millions of people throughout the world who are watching anxiously because their freedoms are at stake. Pitted against each other in this struggle, which has the characteristics of an endless football game, are the vast forces of Free Competitive Enterprise vs. Socialism.

There can be no peace between them and never will be, because the one is the antithesis of the other. Free Enterprise permits the expression of initiative, self-reliance and self-control by the individual. With socialism in operation, government is paramount and the people are its servants. Thus the amount of government reflects the degree of the people's capacity as individuals to govern and control themselves.

We know that Free Enterprise can produce great results. It has been the catalyst that consolidated us the past 177 years from 13 separate colonies into the greatest nation the world has ever known. We also know that Free Enterprise lost the ball in the early Thirties. In the confusion of that period, our socialistic planners snatched the ball and during the next 20 years, they produced a nation bogged down with an astronomical public debt, confiscatory taxes, bureaucratic conflicts, wars, controls, inflation and other economic ills.

Disillusioned by this inheritance, American voters last November rejected big government and their socialistic rulers. In reality Free Enterprise did not register a victory, the voters merely gave this system a chance to carry the ball. Although a Frankenstein monster was created in Washington, still the voters in turning the job over to Free Enterprise expect substantial results.

Throughout those 20 years our business institutions were made a target for ridicule and smear by these socialistic planners, but a solid front was maintained. Now we have a team of capable business people in Washington trying to undo the jumble of mistakes. Theirs is a gigantic undertaking—the streamlining of Government departments and functions, getting it out of private business operations, re-establishing free markets, and returning certain powers to the States where they belong.

Progress in that direction is beginning to show itself although they have been down there a little over three months. Already in the business world there are indications of relaxation in some quarters on the basis "We won in November." Many a game has been lost by letdown or overconfidence on the field. Free Enterprise is not self-functioning, but is dependent upon the efforts of those who believe in it. There can be no relaxing as the months ahead will be critical ones. Again we emphasize, Free Enterprise did not gain victory, but rather an opportunity to carry the ball and show its real running plays. To do this your continued support in action is needed now more than ever before to prevent socialistic planners from getting control.

Engineering Preview of *INDIANAPOLIS*

Glass-Reinforced Plastic for Body Parts, V-8 Engines and New Tires Are Among the Interesting Features to Be Found in Entries for the 1953 500-Mile Race.

By R. Raymond Kay

MORE power, more speed and more cars fighting at the finish! That's how it looks to the racing fraternity for the 37th Annual Indianapolis Memorial Day 500-mile speed classic. Racing enthusiasts all over the world are asking: Has anything new been added? Have they "gone about as fur as they kin go?" What has Chrysler up its sleeve? How much speed and wear will the new Firestone tire give? How about the nine cars with offset engines?

Over 150,000 spectators will see 33 of the finest racing cars. Experts predict that more cars than last year will be fighting right up to the finish for the coveted winner's flag.

And the pace will be fast! Average speed for the race should go up 1½ to two mph. Weather and track conditions permitting, the winning car could hit an average of 130 mph. The one lap record could go to 142 or 143 mph. And it looks as though Chet Miller's 139.034 mph four-lap record set last year in a Novi will be surpassed.

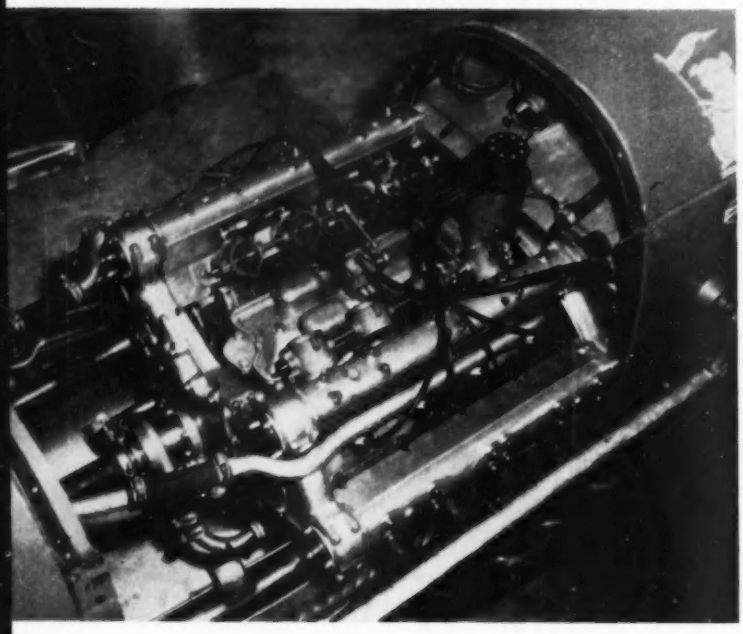
Racing fans should watch the seven new Kurtis-built cars with offset engines. They could be tough competitors, based on Billy Vukovich's 191 pace setting laps last year in a similar car. Top-notch drivers say that cars with offset engines provide better handling characteristics due to lower center of gravity. The advantage of the offset engine arrangement is that it shifts onto the left side approximately 150 lb of weight, depending on the amount of the engine offset. This means even tire wear distribution and better traction during the 800 left hand turns required in the 500 mile grind.

Engines are generating much talk this year. Meyer & Drake's present model four-cylinder Offenhauser 270 cu in. engine, in popular use at Indianapolis for so many years, probably will power 25 or 26 of the 33 qualifying cars. Some experts feel that the four-cylinder models have gone about as far as they can go in developing horsepower without the hazard of greater mechanical failures.

Twelve new "Offies" were built this year. Though basically 1952 models, several engine changes were made this year. The crankshaft is now machined from a drop-forging, the forging forming the crankthrows to required shape. Greater reliability is expected because of improved grain-flow characteristics. Previously, all cranks were machined from round billets.

Another improvement is the water pump drive, now through an involute spline coupling in place of the tongue and slot on previous engines.

Engine designers are saying something new in engines is needed to spark Indianapolis racing. V-8's



MODIFIED STUDEBAKER

Modified Agajanian Studebaker V-8 engine which is equipped with two Hilborn fuel injection units, one for each bank of cylinders.

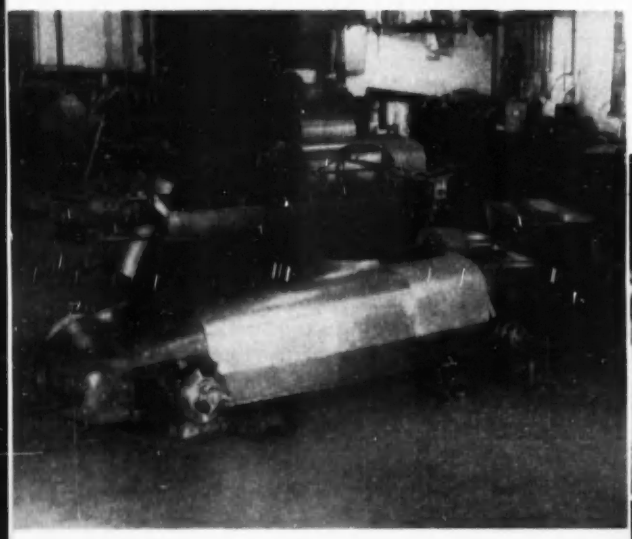
will again be tried this year, although it is agreed they may not be the final answer. Proponents of the V-8 claim increased dependability and higher horsepower over the four-cylinder engines, made possible by the shorter stroke and lighter reciprocating parts. Basically, for a given displacement, the V-8 has a higher revolution potential than the four-cylinder.

Lou Meyer, vice-president, Meyer & Drake Engineering Corp., Los Angeles, told AUTOMOTIVE INDUSTRIES in an exclusive interview, "While our company is also considering plans for a V-8, we will, like all the engine designers and builders, be carefully watching the performance of the V-8's this year. We're glad to see the modified stock car engines entered, notably the Chryslers. They're certainly creating a lot of interest, which is good for racing. Also, we welcome competition. It will be interesting to see whether such engines can successfully compete with engines solely designed for racing."

Chrysler Corp. is known to be spending a large amount of time reworking several of its stock engines to conform to Indianapolis specifications and modifying them to give race car performance. Practically no word has been released from the company, but it is known that three engines will be modified Chrysler V-8's with a bore of 3 13/16 in. and stroke of 2 31/32 in. Piston displacement is 272 cu in.

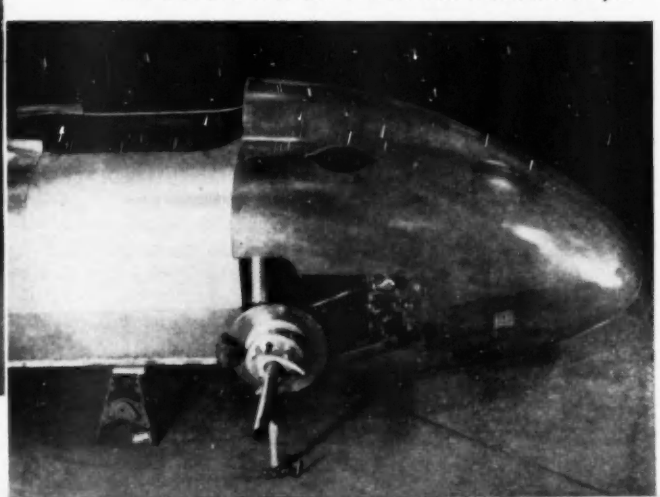
Murrell Belanger, Crown Point, Indiana, has entered one car with a modified Chrysler V-8 and Roger G. Wolcott of Indianapolis has entered two. These cars will certainly attract much attention because of the excellent performance of a Chrysler engine during special tests at the Speedway last summer. The Chrysler engine used at that time had the stock dislpacement of 331 cu in., larger by 57 cu in. than the maximum of 274 cu in. permitted under Speedway rules. Chrysler engineers apparently solved that problem by reducing the stroke sufficiently to comply with existing rules. It is understood the company made new crankshaft

Four of the seven new Kurtis 500-B series race cars in various stages of construction, showing glass-reinforced plastic nose and tail which have been installed on the car in the foreground.

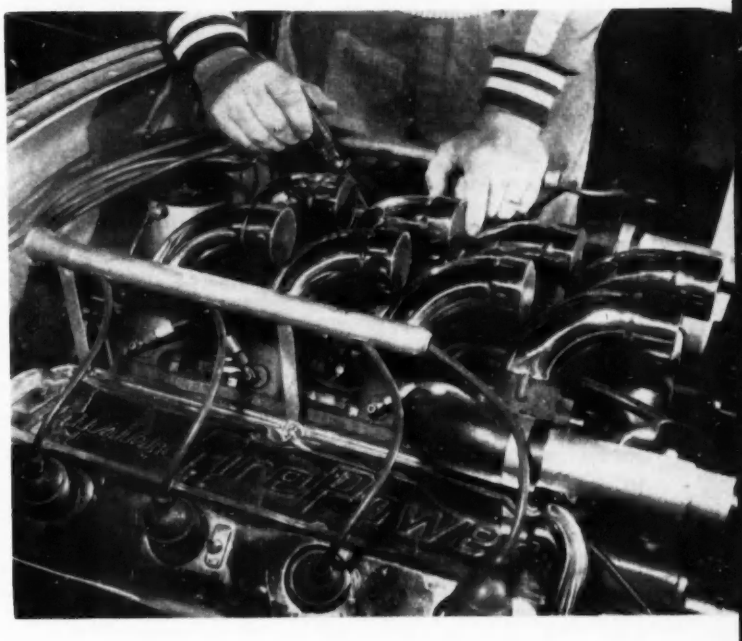


SELECTED VIEWS OF THE

Fiberglas tail contrasts sharply with cockpit aluminum body panel of the Kurtis Series 500-B. Larger fuel filler hole now is on left side for easier access from pits.



MODIFIED CHRYSLER



Closeup of modified engine in the car entered by Murrell Belanger, showing the fuel injection units and magneto. United Press photo.

forging dies to do so. While it is believed Chrysler is shooting at 7000 rpm and 400 hp, experts wonder whether this can be maintained for the four-hour grind. It seems quite likely the expected engine rpm will be attained during some of the faster laps although the average for the entire race will be somewhat lower.

Much talked about, too, is a J. C. Agajanian entry powered by a reworked Studebaker V-8 engine (AUTOMOTIVE INDUSTRIES, May 1, 1952, page 42). It looks as though Chuck Stevenson, AAA champion, will be the pilot. W. C. Utzman, who supervised all the engine work, reports dynamometer tests of 370 hp at 7100 rpm using methyl alcohol. All tests were run at 12.8:1 compression ratio which will be maintained for the race. The designers of the engine feel the maximum horsepower output could be in the neighborhood of 400.

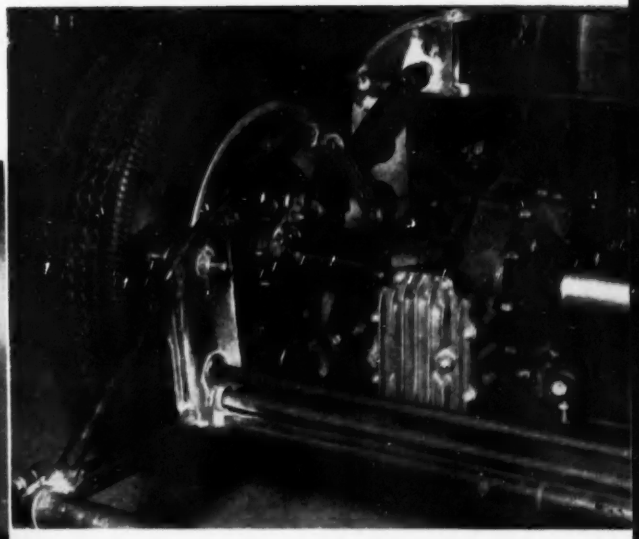
Utzman's V-8 engine now has an 18 lb cast magnesium oil pan for better oil cooling and increased block rigidity. Special main and rod bearings were made for the engine. A special scavenger pump for the crankcase was built using three stock Studebaker oil pump gears in one unit. It will be mounted on the front of the crankcase and driven off the front end of the crankshaft through spiral gears.

KURTIS KRAFT SERIES 500-B

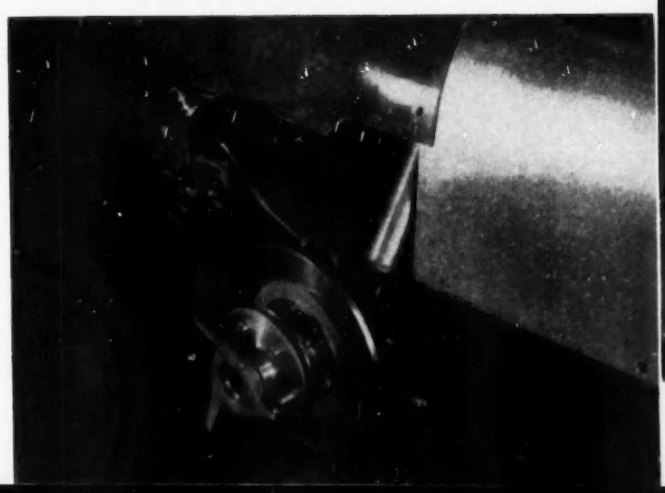
Kurtis Kraft cars will once more dominate the Indianapolis oval. Builder Frank Kurtis, whose chassis designs have contributed much to Indianapolis racing, built eight new cars for the race, his Series 500-B. They are based essentially on the Keck Fuel Injection Engineering Special in which Vukovich made such a fine showing last year. Chief modifications are the use of transverse torsion bars on the rear as well as front, placement of torsion bars forward of the axle in front, widening of the body six in., and better streamlining.

Seven of these new cars will mount an Offenhauser 270 cu in. engine on the left side. Three engines will be placed eight in. off center line, inclined 36 deg from vertical, and four will be six in. off center line but vertical. This offset arrangement

Rear end assembly. Note gear housing on left side and Panhard truss assembly attached to upper and lower tubular frame members, working as sway stabilizer. New Firestone tire is shown.



Kurtis Kraft rear suspension showing spot aircraft type brake, knock-off hub, tubular direct-acting shock absorber, torsion arm (lower) and radius rod (upper).



1954 PREVIEW *

Joel Thorne, Las Vegas, Nevada, has entered a car of entirely new design, employing some principles similar to those used in aircraft construction. Thorne designed the car, engine and four-speed transmission. The car is unconventional in body and chassis construction in that body and chassis consist entirely of a single unit, which is monocoque skin stressed using Fiberglas material. The purpose of this integral design, Thorne says, is simplicity and economy of construction, weight saving, and optimum rigidity. Independent suspension is employed on all four wheels which are solely supported by A arms. All wheels are powered. Thorne plans to use power steering. The car will be equipped with completely sprung four wheel internally cooled disk type spot brakes. Total dry weight is less than 1300 lb, according to Thorne.

The power plant has an aircooled horizontally opposed six cylinder non-supercharged engine of 273 cu in. displacement. Bore is 4¼ in., stroke 3-7/32 in. Other specifications: Seven main bearing crankshaft; silent chain driven dual overhead camshaft; two intake, two exhaust valves per cylinder; valve size of intake and exhaust, 1-11/16 in. Fuel induction is by Thorne-designed pressure spray system with venturi eliminated. Engine is mounted in the rear, forward of the rear axle.

*** Although the car is entered for this year's race, at press time it looks as though it will not be ready. However, we thought our readers would like a preview of an unusual car. —ED.**

Kurtis Kraft cars this year will include 75 gal fuel tanks, and a giant size fuel tank filler cap (approximately 24 sq in.) for quick filling. This may help prevent fuel spilling on to a hot exhaust pipe during pit stops. The caps are mounted on the left side for easier servicing from the pits.

The streamlining of the Series 500-B cars is improved. Usual chassis parts such as torsion bars, shock absorbers and steering linkage are no longer exposed but hidden beneath the racer's skin, lessening high speed air disturbance.

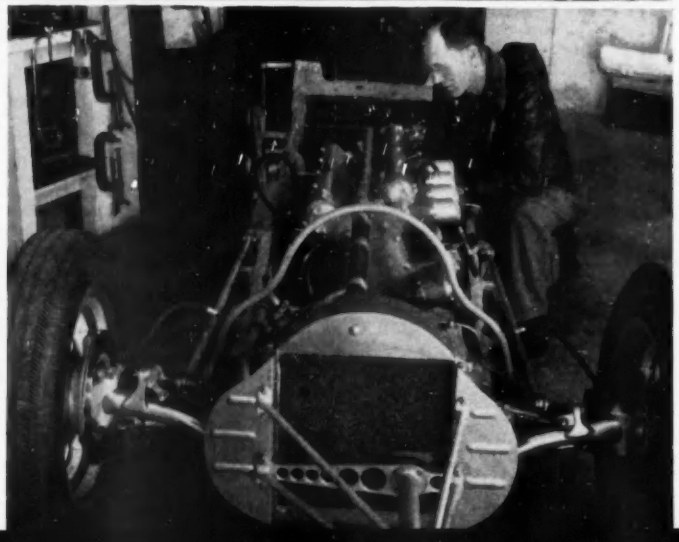
William B. Ansted, Jr., Indianapolis, is again entering the car which featured an off-center driveshaft (AUTOMOTIVE INDUSTRIES, May 1, 1952). It has been renamed the "Cop-Sil-Loy Brake Special." The car's designer and chief mechanic, Roscoe Ford, made two major changes this year. The engine is now reset from a straight up position to a 20 deg angle from the vertical, thus shifting the crankshaft to the left of center 4½ in. This change was made necessary by the installation of a new transfer gear box having two gears instead of three as in last year's entry. The pair of gears replaces the conventional quick change design in the rear end which

(*Turn to page* 120, *please*)

puts the oil tank and transmission on the left side of the cockpit and the driver below the drive line. The design also lowers the center of gravity and puts the weight on the left side. Some designers believe that this arrangement increases the speed potential in the turns. The eighth car will mount in the center one of the Chrysler V-8's in a vertical position.

Fibreglas parts will make their debut at Indianapolis in radiator shell and tail sections on five of the new Kurtis cars. The primary purposes are weight and labor savings, according to Frank Kurtis. A Fibreglas coating is used on the fuel tanks for vibration absorbing and to reduce the hazard of tank leakage.

"COP-SIL-LOY BRAKE SPECIAL"



Upper illustration of the Cop-Sil-Loy Brake Special entered by William B. Ansted, Jr., Indianapolis, shows the new transfer gear box with two gears instead of three used last year. The gear box is mounted on the back of the transmission case. Note that driveshaft is offset eight in.

Lower view indicates how the engine is set at a 20-deg angle in the Cop-Sil-Loy Brake Special. The car has transverse leaf spring suspension at the front and torsion bar rear suspension. Designer and chief mechanic Roscoe Ford is shown in both views.

Brake Disks Deburred

on Special Fixtures in Rotating Barrels

By W. J. Hobday

General Foreman

Wheel and Brake Division, Goodyear Aircraft Corp., Akron, Ohio

STEEL brake disks are among components manufactured in substantial quantities by the Goodyear Aircraft Corp., Akron, Ohio. These disks range from 14 to 18 in. in diameter and are cut from SAE 1035 steel plate, the large hole in the center being bored and the OD turned and notched. Twelve slots are cut radially from the central hole to small holes drilled through the disks between the ID and OD.

Although both faces are machined, burrs are left at notches and slots as well as at edges of the holes and of the OD. Specifications call for removal of the burrs. When deburring was done with hand tools, the time required per disk was 15 min, and even the most skillful operator could not hold uniformity.

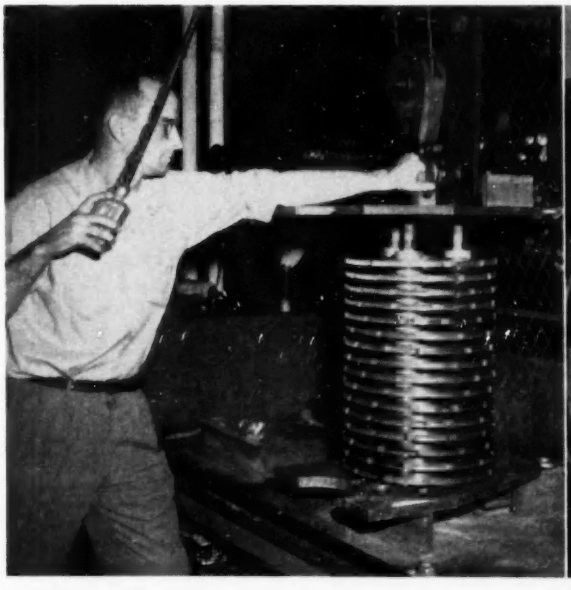
To save labor and also to insure uniformity in deburring, two 36-in. DW-30 rubber lined, single compartment Roto-Finish barrels were installed and are kept in constant use. As the disks are quite heavy and are not adaptable to tumbling without proper spacing, they are clamped in racks or fixtures and the fixtures are locked inside the barrels, as shown in the illustrations.

It is necessary, of course, that the disks be separated by spacers so that the abrasives and compounds employed can reach all edges where burrs are to be removed. Each fixture includes two end plates cut from one-in. steel and welded to blocks that fit into slots on the end plates of the barrels employed. Two eyes for hoist hooks are fastened to each fixture end plate and each is pierced for three through bolts that, when the fixtures are assembled, are parallel to the axis of rotation.

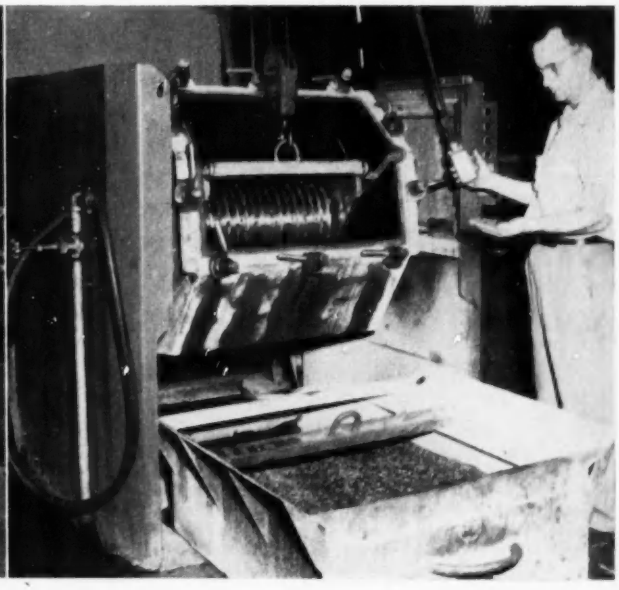
These bolts are so spaced that they pass through the hole bored in center of each disk and close to the ID of the hole. To load the fixture, one end plate is laid on a bench, as illustrated, and the other end plate is removed, leaving the bolts upright. Sixteen disks then are put in place and are separated by washers ¾ in. thick placed over each bolt, after which the top plate is put on and nuts applied to bolts are tightened to

(*Turn to page* 102, *please*)

Disks are clamped in special racks or fixtures as they are not adaptable to tumbling without proper spacing.



A rack filled with disks is lowered into a barrel, and locked so that its axis is in the axis of barrel rotation.



By Joseph Geschelin

Latest Advances in

RECENT trends in passenger car engines, culminating in the new and improved engines in 1953 production, unquestionably point to constantly higher compression ratio and better fuel economy. The most important trend, of course, is to overhead valve design and more widespread adoption of V-8's. In fact, we are pretty sure that the 1954 season will see the emergence of four or possibly five more V-8's.

Since all of the new or revised engines to be considered here have been adequately described in previous issues of AUTOMOTIVE INDUSTRIES, the object of this study is to present the design features of the combustion chambers alone. This has been done deliberately because the combustion chamber is easily one of the most important elements contributing to the development of mechanical octanes. From the standpoint of achieving higher compression ratios there are two major avenues of approach—by means of the chemical octane numbers built into the fuel; and by means of mechanical octanes built into the engine. The latter approach has been explored extensively since the end of the war in an effort to get the highest outputs compatible with available chemical octane numbers.

In discussing the new Buick V-8 engine, which was described at the recent SAE Annual Meeting, Caris and Wyczalek of General Motors Research Laboratories, said "that many factors contribute to an engine's mechanical octane rating or its ability to operate more efficiently on fuels of a given octane rating. These include spark, advance, carburetion, valve timing, volumetric efficiency, and combustion chamber design. These factors are all inter-related and have a bearing on the selection of the compression

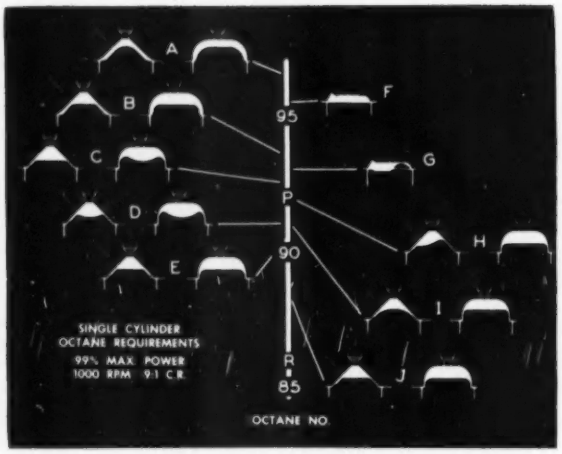


Fig. 1 Single cylinder octane requirements with combustion chambers of different form. Tests at 1000 rpm with compression ratio of 9 to 1, with 99 per cent of maximum power output. (Discussion by Caris and Wyczalek, GMR, at 1953 SAE Annual Meeting.)

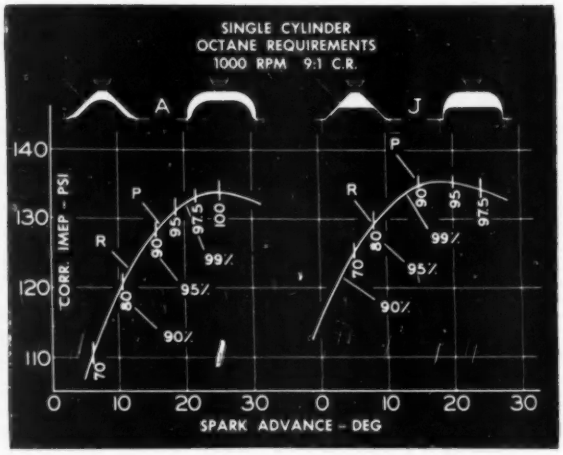
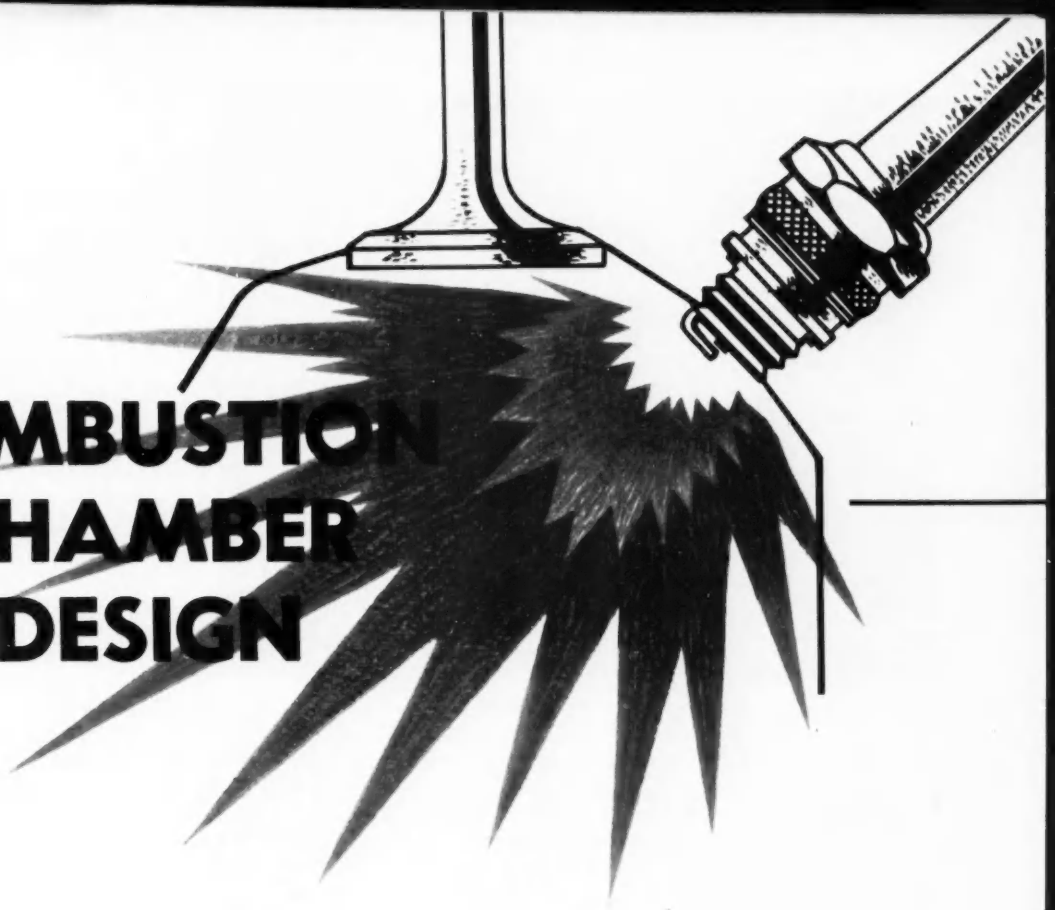


Fig. 2. Single-cylinder octane requirements with varying combustion chamber form and spark advance. Tests at 1000 rpm with compression ratio of 9 to 1. (From discussion by Caris and Wyczalek, GMR, at 1953 SAE Annual Meeting.)



COMBUSTION CHAMBER DESIGN

ratio at which an engine will operate. The relation among these factors in the final engine represents the best compromise the designer can make. Of these many factors—or variables—we found that the combustion chamber offered a very promising field for development."

This article will be confined to combustion chamber design alone, recognizing the importance of the other factors which deserve individual treatment. In each case, we present a cross-section of the combustion chamber, together with suitable comments and claims made by each company. We have deliberately avoided any editorial comment or evaluation of the relative merits of these designs. We feel that the very act of summarizing these latest developments in one place is sufficient to serve the needs of our readers.

It is particularly stimulating to find that individual designers have felt free to explore combustion chamber arrangements to suit the requirements of specific engines. This has resulted in a gamut of different designs—ranging in scope from the F-head Willys-Overland to the hemispherical chamber typical of Chrysler Corp. V-8's. In General Motors there is complete identification and distinctiveness of engines made by different divisions.

In seeking to build mechanical octane numbers into the combustion chamber, the designer has had to resort to the usual engineering compromises required to integrate this feature with the arrangement of other structural elements of the complete engine. While engine designers are cognizant of the variables involved in the combustion chamber, these are not always clear and are difficult to separate from interrelated variables. Hence the compromises and the differences. Too, engine design must take into account certain company policies at the time an engine is being planned for production. We refer specifically to the two divergent schools of thought right now—one that designs its engines for premium fuel exclusively; the other, relying entirely upon regular grades having lower chemical octane numbers.

A few of the more general principles governing combustion chamber design may be enumerated as follows:

1. Specific attention to turbulence of the compressed mixture.
2. Development of the shortest path for flame travel, this being determined by the location of the spark plug with respect to the cross-section of the combustion chamber and location of valves.
3. Development of a suitable quench area.
4. High volumetric efficiency through the use of large valve diameters, free-flowing intake and exhaust ports, and minimum sensitivity to fuel deposits.
5. High thermal efficiency and low specific heat rejection, relying among other things upon compact chamber design, short exhaust ports, and to some extent upon low surface-to-volume ratio.
6. Pre-ignition is an old problem now intensified by the trend to higher compression ratios. This sub-

Bhp/Cu. In. Comparison

Make	Type	Displacement (cu. in.)	Bhp (max.)	Compression Ratio	Bhp cu. in.
Lincoln	V-8	317.5	205	8. to 1	0.646
Cadillac	V-8	331	210	8.25 to 1	0.634
Buick (Roadmaster)	V-8	322	188	8.5 to 1	0.584
Dodge	V-8	241	140	7.1 to 1	0.580
De Soto	V-8	276	160	7.1 to 1	0.579
Willys	F-head-6	161	90	7.6 to 1	0.559
Chrysler	V-8	331	180	7.5 to 1	0.544
Oldsmobile	V-8	303.7	165	8. to 1	0.543
Studebaker	V-8	232.6	120	7. to 1	0.516
Nash (Statesman)	L-head-6	195.6	100	7.45 to 1	0.511
Chevrolet	OHV-6	235.5	115	7.5 to 1	0.489
Ford	OHV-6	215.3	101	7 to 1	0.469
GMC	OHV-6	228	105	8 to 1	0.460

ject is given prominence in a paper "A Method for Identifying Preignition" by Winch and Mayes, Sun Oil Co., at the 1953 SAE Annual Meeting. According to the authors, it is manifested in two ways—at the spark plug; and in the end gas region. And it exists in two forms. In its advanced stages, it can result in extremely rough engine operation, accompanied by loud knock; in milder phases, it may be noiseless but always results in higher temperature and pressure.

Designers have recognized the important role of short flame travel and have emphasized this in current designs. Experimental work shows clearly that means must be taken to effect complete burning of the fuel before detonation has time to occur, at least so far as practical. This can be done only by speeding the combustion cycle, and the most effective way to do it is by high turbulence in combination with the shortest path of flame travel. Examination of the combustion chambers illustrated here will show that plugs have been relocated on existing engines, placed in favorable position on new engines.

The quench area plays several important roles, depending upon combustion chamber form. Unquestionably, its major function is to increase materially the surface area to volume relationship at this region, providing more intimate contact of the compressed mixture with its surroundings. Not only does this

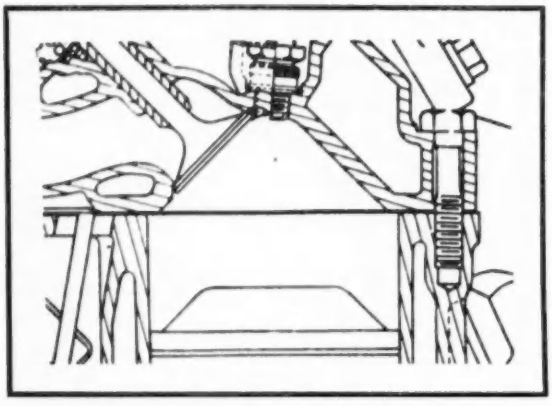


Fig. 3. Buick V-8 combustion chamber detail. Note domed piston design and central location of spark plug.

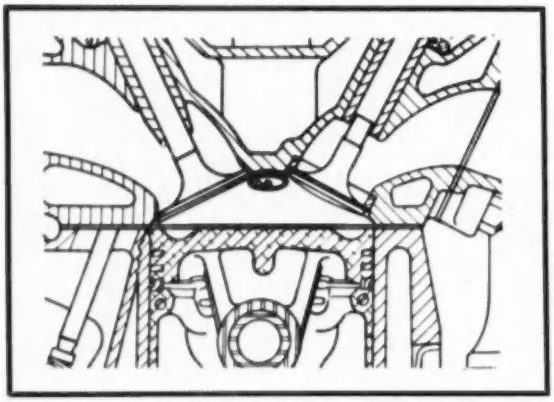


Fig. 4. This is the De Soto hemispherical combustion chamber form typical of Chrysler Corp. V-8's. Attention is drawn to the large diameter valves, set wide apart and actuated from separate rocker arm shafts. The central location of the spark plug is evident.

Fig. 5. 1953 Lincoln combustion chamber is more compact and with reduced quench area. Lincoln has aimed at greatly increased turbulence.

Continued

COMBUSTION CHAMBER DESIGN

speed heat transfer, it also forces the compressed mixture into more intimate contact with relatively cooler metal surfaces, thereby effecting a rapid reduction in temperature at this point. This is considered imperative in reducing detonation and may be a factor in eliminating pre-ignition.

In addition, depending upon the shape of the combustion chamber, the quench area may be effective in further reducing flame travel by cutting the flame front at the junction of the main chamber and the quench area.

Of interest to designers is the experimental work in connection with the development of the Buick V-8 combustion chamber as described by Caris and Wyczalek in their thought-provoking discussion, mentioned earlier. This work was undertaken to answer the question: What are the factors which the designer must build into a combustion chamber to obtain mechanical octanes?

"Our past experience had indicated that if we could shorten the combustion process the charge would complete burning before detonation had time to occur. Therefore, at the start of this development, we *deliberately* set out to speed up the rate of burn, by designing chambers with high turbulence and the shortest possible flame travel.

"Referring to Fig. 1 and comparing designs A and J; it can be observed that Chamber J has a much shorter flame travel and, because of its more effective piston coverage, has much greater compressive turbulence than Design A.

"The fact that shorter combustion time is accompanied by a decrease in octane requirement can be demonstrated by comparing the spark advance values shown by Fig. 2. This chart compares the test results obtained for the original design (A) and the final production design (J). It can be seen that the spark advance value at 99 per cent maximum power for Chamber A is 20 deg and for Design J it is 13 deg. This represents a decrease in burn time of at least seven deg.

"As an additional illustration of the effectiveness of short flame travel in reducing octane requirements, Fig. 2 shows the effects of two different spark plug positions in the same chamber. By comparing the octane requirements at 99 per cent maximum power, which is approximately 92 octane for the central plug position and about 98.5 octane for the point of ignition on the exhaust valve side of the head, it is apparent that Buick's central plug position alone

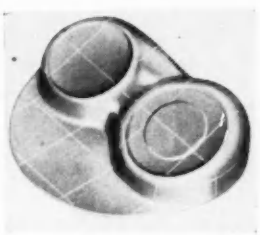


Fig. 6. Three-dimensional model of the Lincoln combustion chamber, emphasizing maximum area around the valves for improved breathing.

Fig. 7. Three-dimensional model of Ford OHV-6 combustion chamber, showing side-by-side arrangement of valves, with spark plug location in thick end.

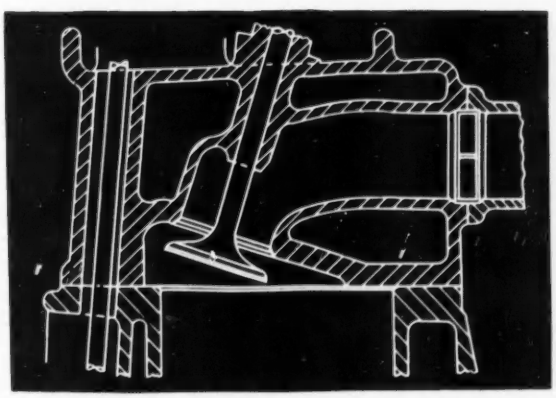


Fig. 8. Cross-section of Ford OHV-6 combustion chamber, emphasizing smooth flow of mixture to the cylinder, resulting from arrangement of valves and streamlining of the large intake passage.

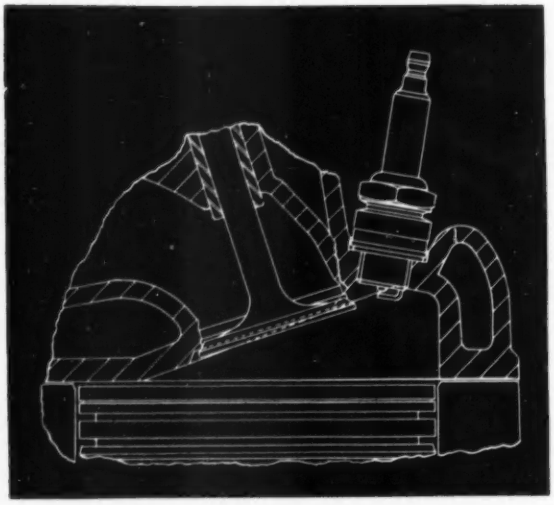


Fig. 9. Cross-section of the combustion chamber in the 1953 Cadillac V-8. This shows the compactness of the revised chamber, featuring a new location for the spark plug as well as the change in contour about the spark plug region.

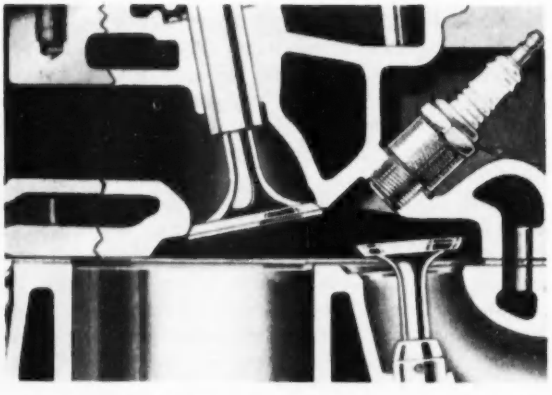


Fig. 10. F-head-6 Willys-Overland combustion chamber, showing intake valve in the head above the piston, and exhaust valve at the side. Spark plug location promotes minimum flame travel.

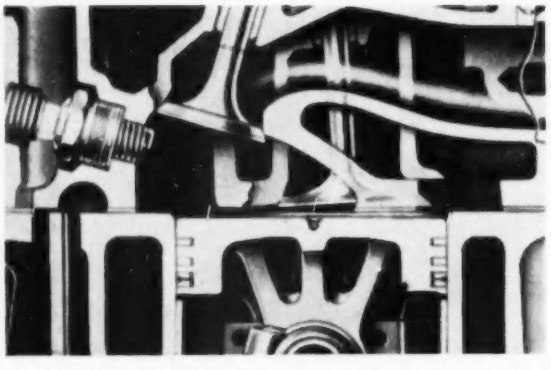


Fig. 11. Chevrolet 1953 Blue Flame engine, developing 115 hp. More compact than before, this chamber has a compression ratio of 7.5 to 1, features central location of the spark plug to effect shorter flame travel.

accounts for a 6.5 octane improvement. Further examination shows that at 95 per cent maximum power, which is more in line with the usual production spark settings selected by most manufacturers, Buick's central plug location reduces the octane requirement from 94 to 79 octane, an improvement of 15 numbers in this range of the octane scale. In addition, it can be observed by comparing the 99 per cent maximum power spark advance values that there is a decrease in combustion time of at least 14 deg for the central plug position. That is, from 24 deg to 10 deg."

Since it is not the objective to evaluate the various designs, from this point on we shall sketch briefly the features of each make, and show a cross-section of the specific design. In addition, Table 1 gives condensed mechanical specifications of all engines included in this study, together with the factor—bhp/cu in.

Incidentally, it may be noted that all designs described here represent overhead valve engines, except for the L-head Nash and the F-head-6 Willys-Overland.

Buick V-8

As shown in Fig. 3, the Buick head has an intake and exhaust valve at one side of the combustion chamber in a plane 45 deg to the normal. This provides easy entrance into the chamber and results in high volumetric efficiency. In addition, the flat 45 deg portion of the piston comes within 0.080 in. of the surface of the chamber, thus aiding in turbulence during the compression stroke. Another important feature is the location of the spark plug. It is within less than $\frac{1}{8}$-in. of the center line of the cylinder bore and is, obviously, in a location resulting in minimum flame travel length.

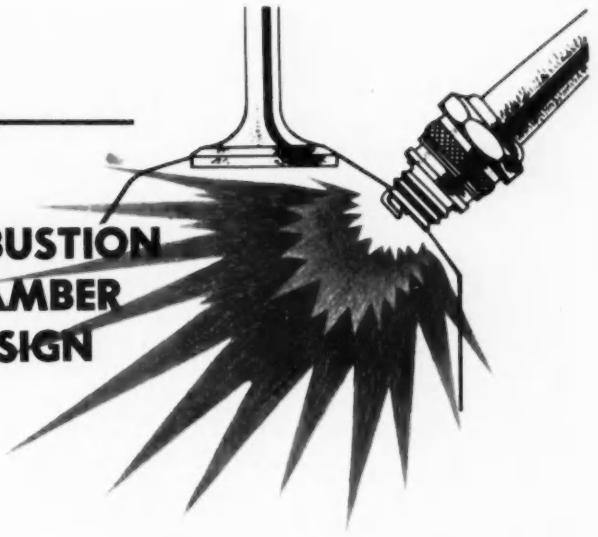
The chamber is fully machined, using a special profiling machine on the production line, to assure positive control of volume as well as the quench area between the sides of the domed piston and chamber. This engine is intended for use with premium fuel exclusively.

Chrysler V-8

Alone among domestic passenger car producers, Chrysler Corp. has developed combustion chamber design of unique character for the new Chrysler, DeSoto, and Dodge V-8's. Chrysler employs a hemispherical combustion chamber, see Fig. 4, which is completely machined to maintain accurate control of form and dimensions and volume. It will be recognized that this design requires special provisions for the valve mechanism and, in this instance, Chrysler has developed an ingenious arrangement involving the use of pushrods and rocker arms operating on twin rocker shafts to drive the widely-separated valves.

Continued

COMBUSTION CHAMBER DESIGN



The hemispherical chamber and lateral valve arrangement permit the use of direct, free-flowing intake and exhaust ports and large valves. This results in minimum resistance to the flow of mixture and rejection of exhaust gases. Moreover, the hemispherical form has the lowest surface-to-volume ratio, geometrically, that is practical in an engine having a flat top piston, according to Chrysler engineers.

Exceptional combustion characteristics are claimed for this arrangement due to compact chamber form as well as to the location of valves and the spark plug. The latter is placed near the center of the compact, symmetrical chamber, thus providing the shortest possible length of flame travel.

Despite the use of a compression ratio of 7.5 to 1 in the Chrysler engine, it is designed to give detonation-free performance with regular grade fuels.

Lincoln V-8

According to the company the 1953 combustion chamber, Fig. 5, is unique from the standpoint that every effort was made to create conditions of maximum turbulence. In 1953 engine output was increased to 205 hp due to changes promoting increased turbulence and quench area. At the same time the mechanical layout made it possible to improve breathing, improve efficiency, increase maximum horsepower and torque and step up compression ratio without objectionable detonation or pre-ignition. It is interesting that at the same time part load economy was improved. Fig. 6 is a three-dimensional drawing of the combustion chamber. It is pointed out that this particular configuration gives maximum area around the valves for breathing, with highest possible compression ratio.

Lincoln also notes an important point which may well apply to all new engines, namely, that the improvements effected this year stem from structural rigidity built into the new engines. Exceptional rigidity of the cylinder block, cylinder head, crankshaft,

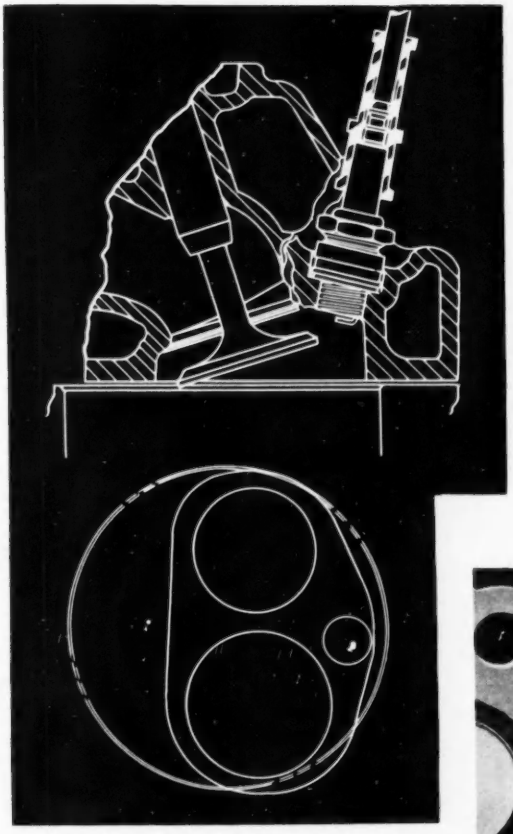


Fig. 12. Seen here is the compact combustion chamber arrangement on the 1953 version of the Oldsmobile 98 engine.

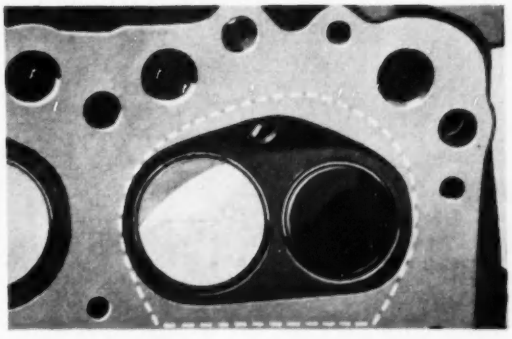


Fig. 13. Here is another view of the Oldsmobile combustion chamber, looking into the cylinder head cavity. The dotted line indicates the periphery of the cavity in 1952 as contrasted with the more compacted shape for 1953.

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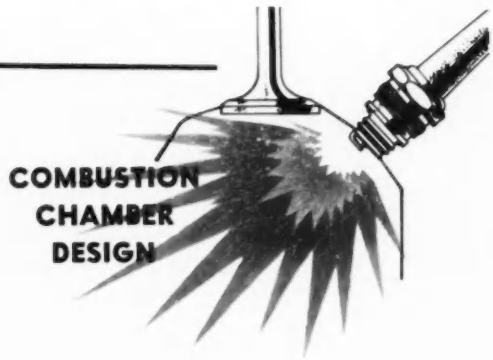


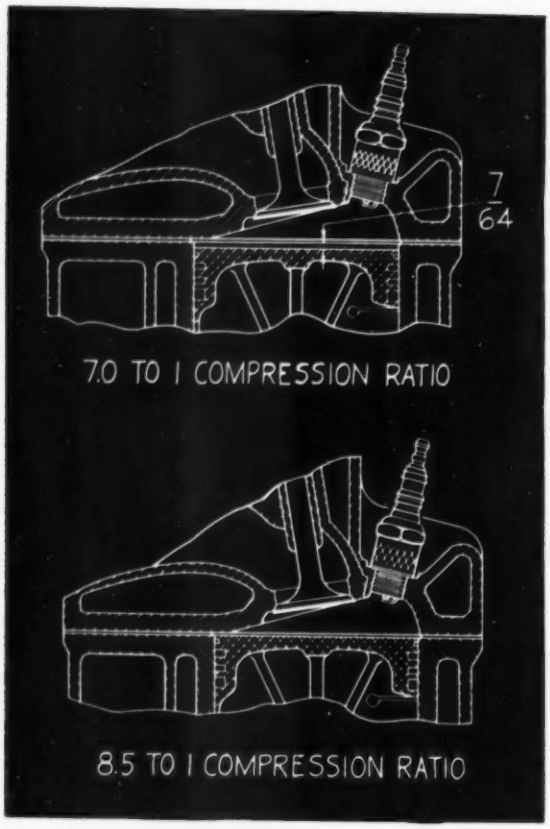


Fig. 14. This is the Studebaker combustion chamber cross-section, the view at the top showing the 7 to 1 profile which is standard in 1953. The view at the bottom indicates the ease with which the engine can be switched to a compression ratio of 8.5 to 1, at will, simply by increasing the height of the piston dome.

and other parts accounts for the ability to withstand the higher explosion pressures associated with greater turbulence, higher compression ratios, and greatly increased output.

This engine is intended for operation with premium grade fuels.

Ford OHV-6

Figure 7 is a three-dimensional representation of the Ford combustion chamber, showing the side-by-side arrangement of valves, and spark plug location in the center of the thick end.

Figure 8, a cross-section of the combustion chamber, indicates the smooth flow of mixture to the cylinder, resulting from the arrangement of valves and streamlining of the large diameter intake passage.

Cadillac V-8

For 1953 Cadillac boosted the output of this engine to 210 hp with compression ratio upped to 8.25 to 1. An increase of 20 hp was obtained without changes in structure, primarily by the following procedure:

(*Turn to page* 92, *please*)

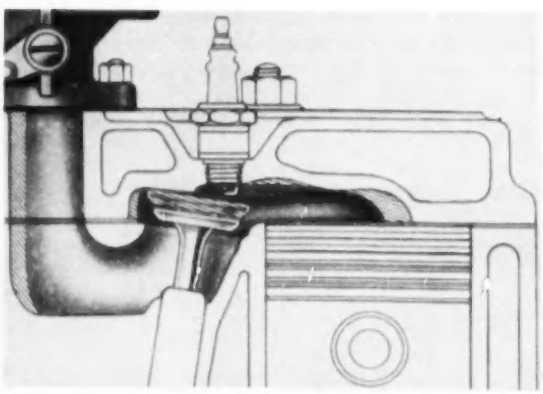


Fig. 15. View of the 1953 Nash Statesman engine combustion chamber which now has a compression ratio of 7.45 to 1. The areas indicate changes from previous practice—larger diameter valves, larger intake port diameter, and changes in chamber profile.

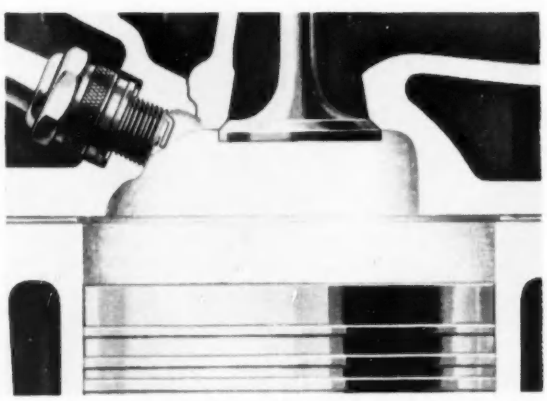


Fig. 16. GMC 228 truck engine combustion chamber, having a compression ratio of 8 to 1, is, nevertheless, capable of operating on regular grade gasolines. Featuring large diameter valves and porting, it has a flat-domed aluminum piston and a smooth shallow combustion chamber dome.

Vacuum testing device which indicates tightness of all valves in tractor engine cylinder head subassembly.

Special Device Tests for Leakage in Valve Seating

A SIGNIFICANT feature of present day engine production is found in the attention to detail at every point. An interesting example of this is the recent installation of a unique vacuum testing device at the Ford Motor Co. plant in Highland Park for testing the tightness of valve seating in the OHV cylinder head subassembly for the new Ford tractor engine.

Developed by Whittington Pump and Engineering Corp., in conjunction with Ford engineers, this device provides a fast and fully automatic test for the detection of valve leaks, thus assuring maximum performance and freedom from trouble on the test stands or in the hands of the owner later on. In addition to giving assurance of specification quality, and elimination of costly tear-down in the event of valve leakage or burned valves, this test also provides tangible test data which can be gainfully used in tracing manufacturing problems which may contribute to faulty valve seating.

The Whittington vacuum testing machine was designed to fit snugly into the conveyor line so as to facilitate automatic handling. It is designed to test a maximum of 230 heads an hour, actual time per unit ranging from 12 to 15 seconds. The cylinder head is pushed into the test machine, block side down, from a roller conveyor. Suitable stops and guides position the part for sealing by a bottom pad mounted on an air cylinder. The bottom pad lifts the part against top locators while auxiliary air cylinders close the spark plug holes. Then vacuum is drawn in each of the combustion chambers. Vacuum is shut off at 25 in. of mercury. If vacuum does not drop below 20 in. mercury in four seconds, the seating of valves is considered "Good." Condition of the valves in each combustion chamber is indicated by a pair of lights, green for "Good" and red for "Reject." Thus, if all valves are "Good" four green lights will show. In the event of a "Reject" a red light will show indicating the chamber having a faulty valve condition.

The test cycle is automatic. The operator places the part in position and depresses two pushbuttons momentarily. The machine makes the test and releases the part which is then ready to push onto the exit conveyor. The indicating lights show the condition of the part tested until the next test cycle has been started.

The vacuum producer for this test machine is a five hp water jet type vacuum pump. It is located on the building structure over the test machine. The vacuum pump is controlled by a selector switch located near the test machine. The test machine and the vacuum producer are built to J I C electrical standards.

This method of flow testing is said to be fast and capable of accurate qualification of valve condition. What is of equal importance at Ford, it provides a method useful in tracing trouble as well as in providing the necessary statistical data for establishing tolerance limits for quality control.

"Production Tomorrow"...

NEW developments in plants, machines, and methods were the topic of discussion at the SAE Annual Production Meeting and Forum held in Cleveland, Ohio, recently. Although the vast number of engineers in attendance talked about the future in manufacturing practices from the standpoint of the automatic factory and automation, there still was keen interest in everyday problems.

Altogether, eight panel sessions were held and four technical papers were presented at the three-day meeting which had as its theme, "production tomorrow." All of the meetings were well attended, and it appeared as though everyone had a problem which was offered for solution before the forum panels.

The eight panel discussions covered quality control, production control, grinding and cutting tools, foundry techniques, forgings, material handling, preventive maintenance of plant equipment, and assembly methods. One of the interesting thoughts to come out of the quality control panel was that some day companies might be rated on a quality basis just as they are rated financially today. Another significant statement made by an engineer in attendance was that his company does not pay any invoices on new machinery until the machine proves itself by quality control charts in respect to the product.

At the forum on production control, it was pointed out that the sales forecast, materials control, inventories, and the capacity to accomplish play the major roles in that field. A basic subject of discussion dealt with lead time. The panel agreed that lead time is peculiar to a type of product and could not be answered in a general way, although many helpful ideas were advanced.

Brazing problems of chrome borides, tool breakage, coolants, and the machining of titanium were the major topics receiving much attention at the panel on grinding and cutting tools. One engineer stated that titanium can be turned at 50 to 70 fpm using carbide tools, and for HSS tools the speed should be cut down to 17-20 fpm. It was pointed out also that with titanium, tool pressure is a problem and there is a tendency to crater the tool. Concerning coolants, several of the newer types were discussed along with the various

Determining Production Cost Factors

By John B. Lathrop

Arthur D. Little, Inc.

ESTIMATION of unit product costs is of prime importance to industrial managers as a basis for controlling the efficiency of production operations, as part of the information needed for setting pricing and sales policies, and as a guide to direction of engineering effort. The two most common sources of unit costs appear to be time studies and engineering or technological requirements or limitations.

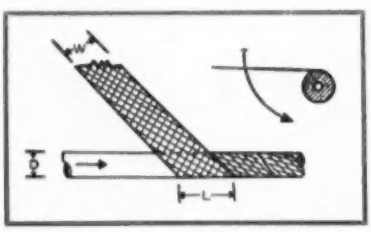


Fig. 1—Geometrical characteristics of the taped wire.

There are many cases when time standards are neither specified by the technology nor readily determinable by time-study methods. The operating times of complex semi-automatic multi-purpose equipment with fairly long production cycles may depend both on the efficiency of the operator and, in a complex way, on a number of characteristics of the input material. The length of the individual production cycle, the wide variation in operator tasks depending on the particular job assigned, and the number of possible uses of the equipment, may make usual time-study or job-analysis methods unworkably cumbersome. In such cases, operations research analysis of routine statistical data from shop operations may be used to derive usable time standards.

An example arose recently in a study of some operations in an electrical wire plant. The operation concerned was that of "horizontal taping," in which a partly completed cable is covered with a helical layer of cloth or metal tape. This is done by pulling the cable through the center of a rotating disk, the "taping head," which carries a roll of tape. The tape is unwound, and through a set of rollers presented to a moving cable at an angle such that in one rotation of the taping head one turn of the helix is placed upon the cable with a prescribed (small) overlap.

There are thus two inputs: first, the cable, which has two important characteristics—the diameter, and the state of cure of the rubber insu-

By
Thomas MacNew

Theme of SAE Meeting

new types of coolant systems. The use of carbon tetrachloride as a coolant was brought up, but panel members advised against its use in most plants.

The foundry panel agreed that foundries should be made more attractive and healthful places to work in order to obtain badly needed new employes. Some foundries are trying to obtain students for training purposes. Community relations are considered a factor as an aid to the foundry.

Forging presses and heating equipment of various types were the main topic of conversation at the forum on forging problems. A great many individual questions rather than those of a general nature were presented the panel.

Transportation costs in respect to the return of materials handling containers constituted much interest at the materials handling discussion. It appears that many firms are interested in lightweight collapsible returnable containers. The panel stated that 30 per cent of final product cost is materials handling expense. Another item of interest was the use of a lighter type overhead conveyor system. Cables were widely discussed for this use.

Cost was a factor at the preventive maintenance session. Selling management on a program and using sales forecasts as a program basis were widely discussed. Incentive plans and the justifying of expense for special equipment were two items which created much interest at the panel on progressive assembly techniques and methods.

Robert Cass, SAE president, and assistant to the president of the White Motor Co., talked on preparedness and production at the annual dinner. One of the things brought out was the use of imagination to exploit mass production techniques. He also discussed foreign trade and the metal situation.

Abstracts of three of the four papers read at the meeting are presented herewith. An abstract of the paper by D. S. Harder and D. J. Davis of Ford Motor Co., which was devoted to the automatic factory, appeared in the April 15 issue of AUTOMOTIVE INDUSTRIES, starting on page 40.

lation; second, the tape, which also has two characteristics—width, and kind of tape. Only a single product was produced from a given set of input materials, so that there was no dependence of production rate on the product characteristics.

In setting up the model for this machine, some assumption had to be made concerning the nature of the property that limits the speed of taping. It was assumed that taping speed is limited by the tensile strength of the tape, which must be unwound from its roll at a high rate. A model was established from the geometrical characteristics shown in Fig. 1.

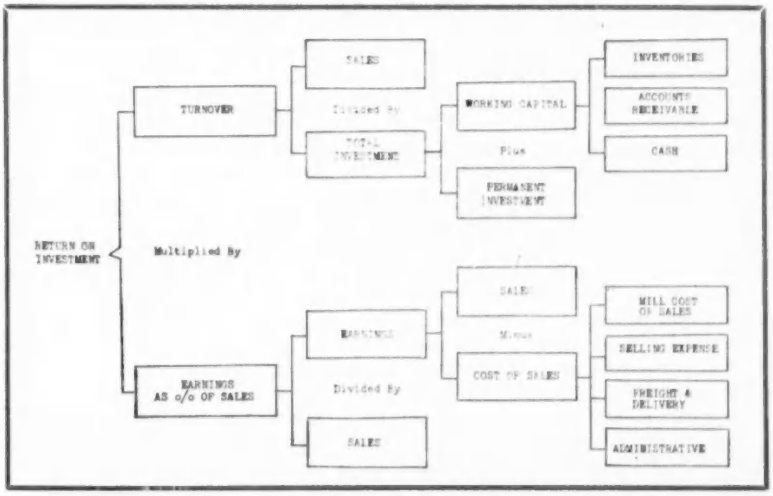
On the assumptions that the tension in the tape is proportional to its speed, that the strength of the tape is proportional to its width, and neglecting overlap, the limiting machine speed is:

$$K \frac{w}{\sqrt{\pi^2 d^2 + l^2}} = \frac{l \pi d}{\pi^2 d^2 + l}$$

and the time required to produce a length L of the product is:

$$T = t_o + K \frac{L}{l} \left(\frac{\pi d}{l} + \frac{l}{\pi d} \right)$$

When attempts were made to fit this equation to available data (time and payroll information for several hundred jobs of varying length, cable



Relationship of Factors Affecting Return on Investment

diameter and lay) values of the constants for the three machine types involved were inconsistent, and, in some cases, physically meaningless. However, by recognizing correlation among variables and bias caused by the prevalence of short jobs, modifying least-squares procedure by trying geometric means and combinations of variables, satisfactory constants were found. The model then explained 94 per cent of the original variance with physically meaningful constants, and revealed the fundamental differences among machines and products.

It was possible to set up a job "quality control chart," based on estimates of the standard deviations of the values of t_0 and K. There is considerable uncertainty in the time required for identical jobs, but with the aid of this chart, the foreman is able to decide if the time required is unreasonable or not.

These examples represent only simple illustrations of the scope of operations research. It has been useful in other areas such as the evaluation of control of sales promotion and advertising programs, the design of optimum distribution systems, and financial planning requiring the evaluation of alternative demands for capital expenditures. The ultimate goal of a company's operations research team—a very distant goal in most cases—is to provide a quantitative model of the operations of the entire enterprise. The framework upon which such a model would be built—and within which the important relationships would be established—may look much like what is often called the du Pont Investment formula, illustrated by Fig. 2. Return on investment has been chosen as the ultimate measure of effectiveness, and the effect of a change in any of the important operating areas of the company can be traced to it.

Cleanliness Essential for Detroit Gear's Automatic Transmission

B. H. H. Whittingham

Detroit Gear Div., Borg-Warner Corp.

In the initial overall consideration of the specifications we found that we would have to manufacture and assemble 330 different part numbers going in the assembly with a tolerance of only ½ gm of foreign matter permitted. Actual current production is averaging about ¼ gm as testimony to the thoroughness of our methods. In relation to the total weight of the transmission, this is one part in 336,000.

The first step was to insure receipt of exceedingly clean castings, with rigid inspection to see that all core sand, scale and teats were removed. This called for development of improved foundry practices as well as a number of unique cleaning methods to accomplish our goal with reasonable economy. These are largely shot blast cabinets that have been tooled for single purpose operations at various points in the line.

Assembly rooms are all pressurized and air-conditioned. Dust is kept down during working hours by use of a vacuum cleaner to keep floors clean without raising dust and they are washed between shifts each night.

No air hoses, no rags, wood, leather hammers or any fibrous material that can break up into foreign matter that can get into the parts and valves in the transmission are permitted in the assembly room.

All parts are conveyed through the plant, from operation to operation and to the final assembly line in these wire baskets. An adequate supply of these are made up special for each part. They stack easily and are easily loaded on to the tray conveyors. They are great promoters of cleanliness. Since they have no closed bottoms they do not accumulate dirt. They have no wooden pegs from which splinters can peel off to find their way into the transmission. In going through the washing machines, water flows freely not only over the parts but of course through the basket removing all dirt from both. They mean a great saving in handling material and above all have so protected our gears, while in the green, as to reduce the well known problem of nicks to the vanishing point.

It was found that all burrs had to be removed to a degree far beyond that normally associated with automotive production. On all parts

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Automotive Hot Extrusions

By John H. Friedman

President and General Mgr., The National Machinery Co.

Hot extrusion of automotive wheel spindles in one of this country's leading forge plants permits a material saving of 30 per cent over the previous method. This amounts to a saving of 10 tons of steel per day at a production rate of 400 spindles per hour. In addition, extrusion has brought about a saving of 20 machines, 4000 ft of floor space, and 65 per cent of former labor cost.

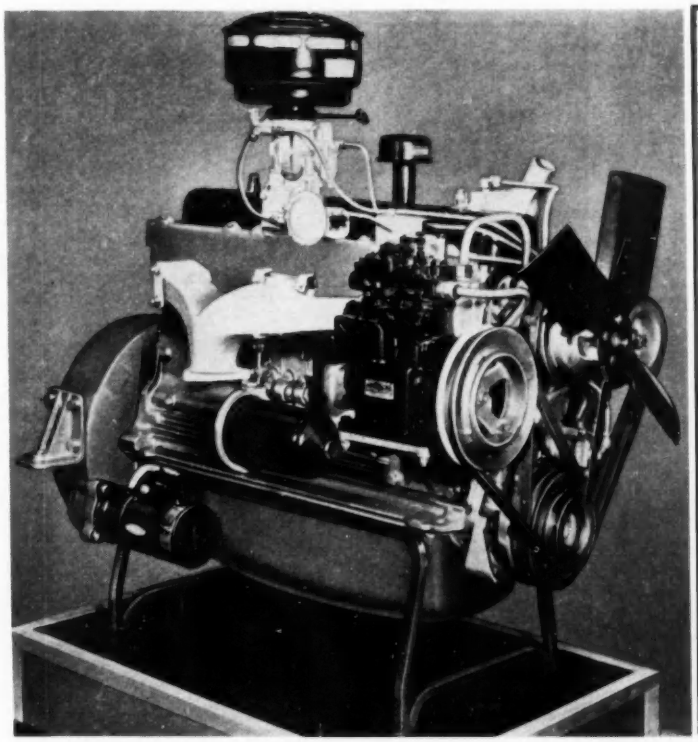
The improved flow pattern of the extruded metal produces a stronger wheel spindle, having an average fatigue life 17.3 per cent greater than hammer-forged spindles. Estimated savings in die cost amount to about 40 per cent. Stock is 2½ in. round SAE 5132 bar stock. The extrusion method reduces the billet weight from 7½ lb to 5¼ lb.

Extrusion worked still more miracles of economy and efficiency in automotive forging with the application of this method to the engine valve. Stock is 1 in. round by 1 5/32 in. long. In only two operations a finished valve forging with a 1½ in. diam head and length of 5⅜ in. is realized. The reduction in area is 86.5 per cent and the die extrusion angle is 74 deg included.

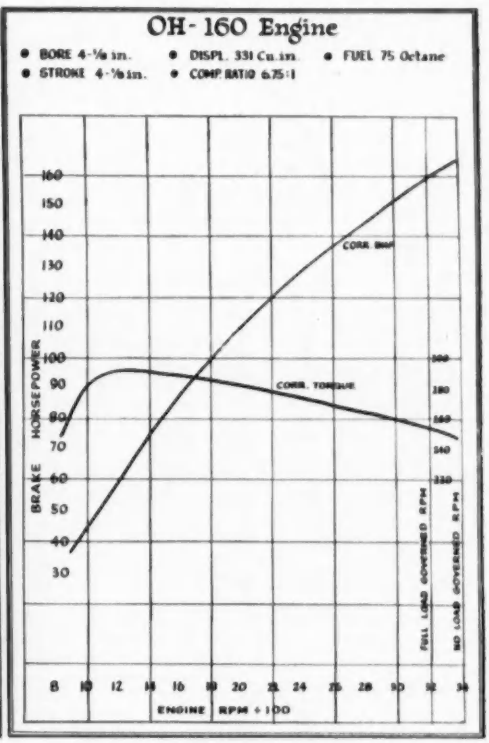
Automatic heating and handling of these large quantity valves have enabled forgers to get maximum benefit from the mechanical forging presses used in making these extrusions. Quoting an experienced producer of these valves: "We started out with 2½ men and made 225 valve forgings per hour. Now one man produces 700 per hour." The expected standard is still climbing and 1000 per hour has been regularly attained.

A jet aircraft engine compressor blade blank is being hot extruded in a Maxipres from a 403 stainless billet 1¼ in. round by two in. long. To save stock and reduce the amount of flash on the blade forging, the material is further formed in a third blow. The shape and angle of the upset head approximate closely the shape and angle desired in the finished forging.

As better and better die steels and lubricants become commercially usable, so also will there be advanced engineering methods and automatic high-performance machinery.



Right hand side of Reo OH-160 engine, showing new mounting of carburetor directly on the intake manifold.



Typical power curves for Reo OH-160 engine.

New Reo Gold Comet Engine Develops 160 Horsepower

CONDENSED MECHANICAL SPECIFICATIONS
REO GOLD COMET ENGINE, TYPE OH-160

Type	Overhead valve
Bore	4⅛ in.
Stroke	4⅛ in.
Displacement	331 cu in.
Number of cylinders	6
Piston rings—number	4
Compression	2
Oil control	2
Compression ratio	6.73 to 1
Governed hp*	160 @ 3200 rpm
Maximum torque (lb ft)*	290 @ 1400 rpm
Number main bearings	7
Lubricating oil sump capacity (less filter)	8 qt
Cooling system capacity	23 qt

* These values given without fan or muffler.

SINCE the introduction of the Type OA Gold Comet engine (see AUTOMOTIVE INDUSTRIES, July 1, 1949) Reo Motors, Inc., has produced over 100,000 of these units for various uses and has gained considerable experience with the potentialities of its design features.

Stemming from this background Reo has introduced the OH-160 engine, which is designed for applications requiring greater output and increased performance. This engine develops 160 bhp (gross max) at 3200 rpm as compared with 140 bhp (gross max) for the OA engine.

The OH-160 engine has exactly the same displacement as does the OA model —331 cu in. Moreover, it has the same basic design features and is almost the same in appearance, except for a few

(*Turn to page* 116, *please*)

By Bruce Edsall
Senior Project Engineer
Automatic Transmission Development
Cadillac Motor Car Div. of G.M.C.

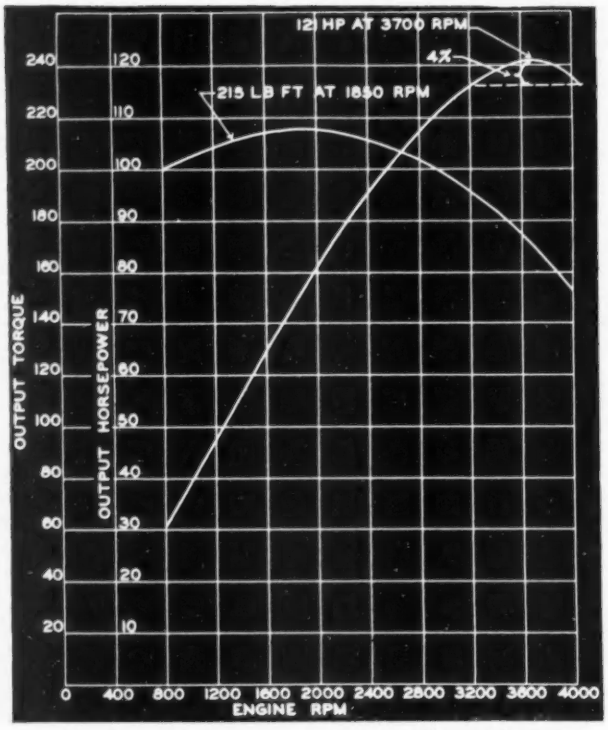


Fig. 1 — Average passenger car engine performance.

The Ideal Automatic Transmission

THE question arises as to why there are so many variations in automatic transmission design when it would seem that *one* fundamental design would have resulted if all manufacturers had a common objective.

The answer is that no one of these transmissions completely satisfies all of the possible requirements of an automatic transmission. All represent compromises which are inherent with a fundamental design. Advocates of fluid torque converters, geared ratios, fluid couplings, lock-up clutches and other transmission features each place emphasis on a single advantage and minimize the advantage that an alternate design provides.

When evaluating a transmission, four major factors and a number of minor factors must be considered. In listing the four major factors no particular emphasis is intended by virtue of their order of presentation. All are of primary importance to automatic transmission evaluation, although it will be observed that manufacturers themselves have exhibited preference in their product design. The four major factors are:

1. Completely automatic performance. This feature requires the following:
   a. The ability to start, drive, brake or reverse with no driver action other than manual selection of the transmission control.
   b. The ability in drive range to power shift through any ratio change and automatically provide the driver with the correct ratio for maximum performance.

   This is characterized by the absence of a clutch pedal and by the lack of requirement to return to zero throttle to obtain an upshift.
2. Complete smoothness of operation. This, of course, implies absolute smoothness or lack of feel when a ratio change is made.
3. Economy of operation. The feature that shows up in gasoline mileage after a customer buys a car.
4. Cost of manufacture, which is self explanatory. The transmission must be competitive costwise.

The ideal passenger car transmission or "Idealomatic" would provide the driver with all of these features without compromise.

The objective of this paper is to show how the fundamental designs of today force an immediate compromise of the four major features and fall short of our bogey transmission, the Idealomatic.

In the discussion that follows it will become apparent that if it were possible to combine the best features of all of today's transmissions into one package the result would be an Idealomatic.

Automatic Performance Characteristics

One of the primary functions of the Idealomatic is to provide maximum full throttle performance automatically. Even the Idealomatic is a compromise in this case since consideration must be taken of the engine and its noise level characteristics.

Figure 1 shows the performance characteristics of an average passenger car engine. This curve, incidentally, was obtained by averaging a number of 1951 passenger car engines.

It is to be noted from this curve that the horsepower peak occurs at 3700 engine rpm and the torque peak occurs at 1850 rpm. It is also significant that the maximum hp available varies only four per cent in the 3200-4050 rpm range.

Maximum full throttle performance could be obtained from this engine by providing an infinitely variable transmission with 100 per cent efficiency that would allow the engine to operate constantly at 3700 rpm, its horsepower peak.

Due to the objectionably high level of engine noise that would prevail at low car speeds, this transmission, even if it were attainable, would not suit passenger car requirements.

Figure 2 shows this performance characteristic as the upper curve, on the sheet. In order to obtain this curve, an average car weight of 3700 lb was assumed and an axle ratio of 3.0 with a 28 in. tire diameter. The last two items represent present limitations on the overall power train economy ratio.

The engine speed curve that could give a pleasing characteristic combined with performance is shown on Fig. 3. This shows the engine speed at 1900 rpm, just slightly above the engine's torque peak, at zero car speed. As car speed increases the engine speed rises proportionately passing through the horsepower peak at 86 mph. It is to be noted that within four per cent of maximum horsepower is available for torque conversion from 62 to 100 mph.

Up to this time only 100 per cent transmission efficiency has been considered.

If we are to use as our Idealomatic bogey the best characteristics of present automatic transmissions an efficiency curve must be assumed.

The assumed efficiency is shown in Fig. 3, and is the average efficiency of the most efficient fluid coupling type transmission today.

The maximum torque conversion ratio required at zero car speed would be that which would slip the wheels on a 60 per cent grade. With the axle and wheel ratio previously specified a transmission ratio of 4 to 1 would more than meet this requirement.

The torque conversion ratio of the Idealomatic, is therefore, shown in Fig. 3. Starting with a 4.0 ratio at stall the conversion is traced throughout the speed range.

The torque ratio beyond stall is the maximum possible with the efficency and engine speed limitations that have been set.

At this point it is interesting to note that we have set up requirements that no fundamental design of today can meet. The efficiency curve taken as a bogey is for a fluid coupling type transmission and converter type transmissions fall well short of this mark.

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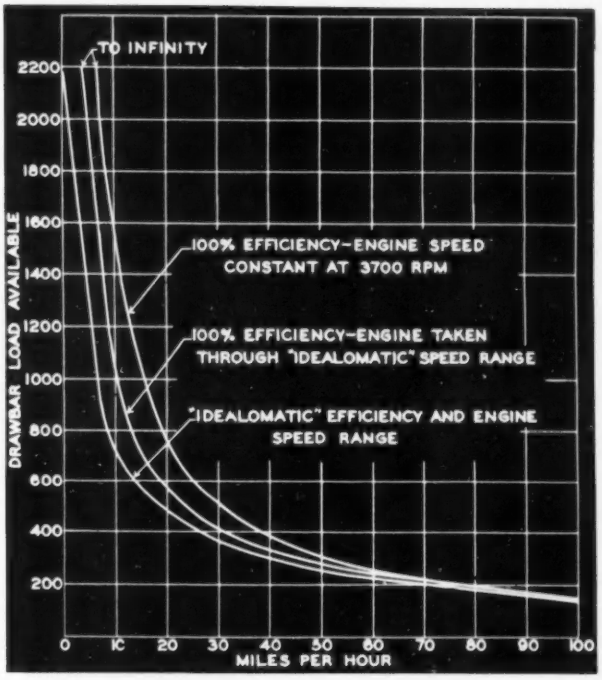


Fig. 2—Drawbar load with Idealomatic transmission compared to maximum available drawbar.

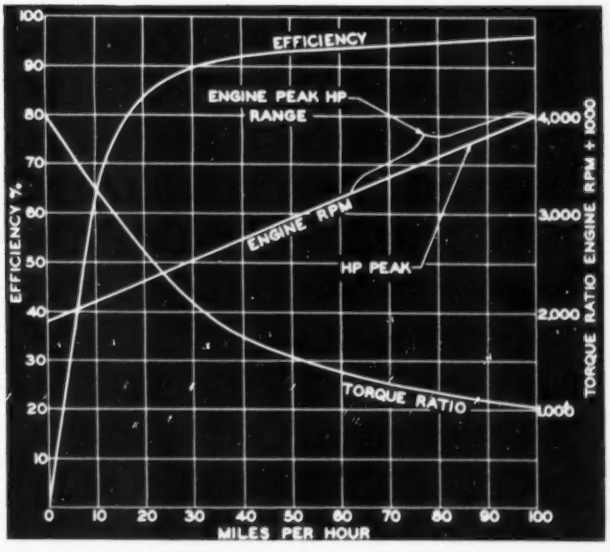


Fig. 3 — Idealomatic performance, full throttle. Efficiency, torque ratio, and input speed with average passenger car engine.

Greater Automaticity for J-47 Turbojet Engines

By Thomas Mac New

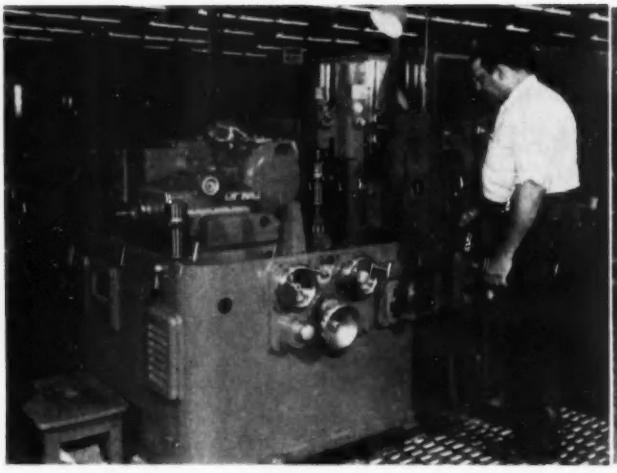
THE Evendale, Ohio, plant of the General Electric Co. with its more than 9000 employes is now in production on the latest models of the GE J-47 turbojet engine. Equipped with some of the newest machine tools available and utilizing many of the most modern methods known, the manufacturing facilities of the new Evendale plant have had the advantage of the vast experience and know-how gained by GE during its 11 years of aircraft gas turbine production.

One of the first major components to be taken from the production floor of the Parts Manufacturing Building to assembly since the official plant opening (AUTOMOTIVE INDUSTRIES, April 15, 1952) was a complete compressor stator section. Basically, this section is composed of three major components—a compressor housing or casing, housing stator rings and blading, and compressor rotor wheels or disks with blading.

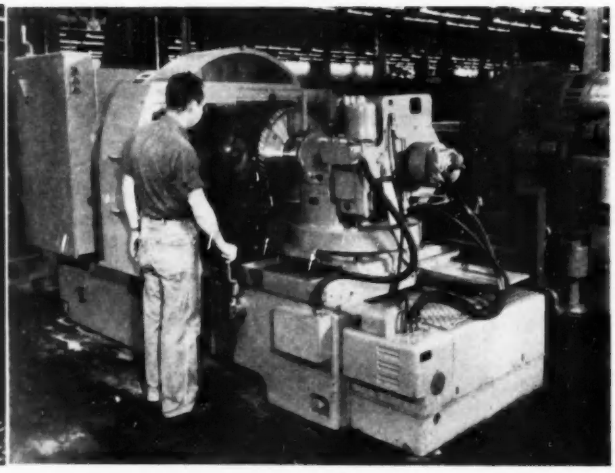
Compressor housings are made of either Alcoa or Bohn aluminum. Each complete housing consists of two shells, which are delivered to the Evendale plant as rough castings. These castings do have, however, integral spots for locating in the machine tools. There are two of these locating spots on the right hand side of each half of the housing and one on the left.

Upon receipt of the castings from outside contractors, GE puts them through rigid fluorescent penetrant and X-ray inspections before passing them on for the various machining operations. One of the first machines to start metal removal on the housing is a Cincinnati Hydromatic two-head milling machine which is used for milling the joint faces of the compressor housing shells. This machine is equipped with a keyway cutting tool and an automatic inspection device of the No Go - Go variety. Approximately ¼ in. of metal is removed by the machine tool in one roughing and one finishing cut. Cutter speed is 600 rpm and the feed is 0.007 in. The keyway cutting head is used to machine a keyway for the prevention of

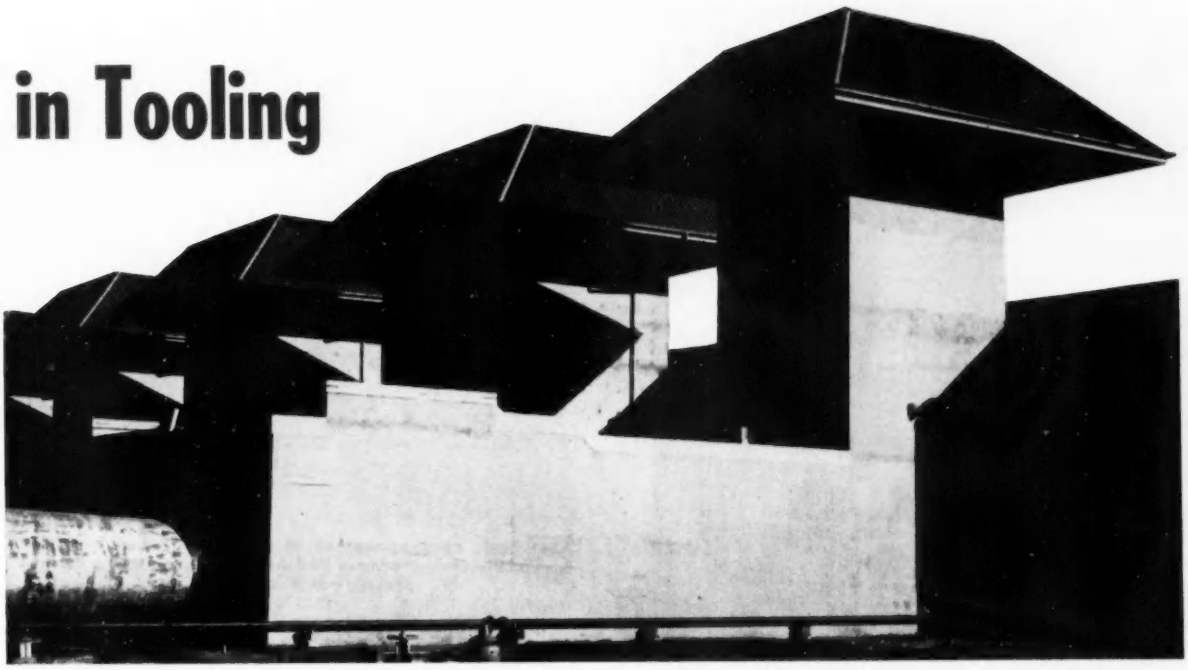
One of the few foreign machine tools in the plant is this Swiss Reishauer automatic grinder. It grinds accessory gears to very close tolerances.



Curvic coupling teeth are ground in the compressor rotor wheels by a battery of Gleason grinders. These machines grind the teeth to a tolerance of ± 0.0002 in.



in Tooling



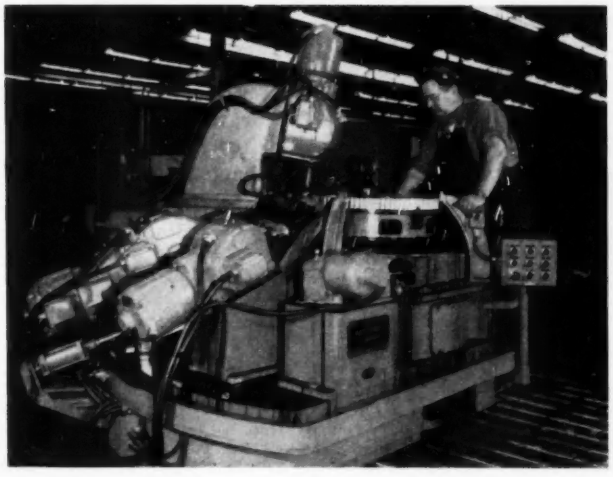
These massive concrete structures are test cell air intakes for production jet engines on test at the GE Evendale, Ohio, jet center. Air rushes to the engines in the test cells beneath at approximately 100 mph. When the air leaves an engine, it is travelling at 1300 to 2000 mph. Design of the cells and their exhaust (not shown) greatly reduces the sound levels of engines being tested.

stator ring rotation in the compressor housing.

Most of the machine tools throughout the new plant are utilizing the latest Carboloy carbide tooling for working on the various alloys encountered in the production of gas turbine engines.

Housing shells then are located in a Taft-Pierce backspotfacer for machining the end faces. Next, two shells are taken and assembled into a complete housing, utilizing some of the holes just backspotfaced. The entire housing is loaded in a Bullard Man-Au-Trol vertical turret lathe. This machine, having two heads, each with a manual turret index, works on the bore of the housing.

This Hartford Special four-head machine tool is used for drilling, reaming and countersinking 96 holes in the turbine wheel.



It is significant to note that in the Bullard operation the entire compressor housing is suspended on two pins for vertical location and butted against its ears for support. Work on the bore of the housing consists of turning the top and bottom OD as well as 13 internal T-grooves. In the first phase the machine roughs out the workpiece to within 0.015 in. Rough and finish machining time for each groove is on the order of 2½ to three min. Following this machining, the complete housing is required to pass 46 different inspection checks.

A Warner & Swasey tapper is used for drilling and tapping 48 holes per housing face, and then the housing is returned to the Taft-Pierce backspotfacer for facing the end flange holes. After the unit has been machined, it is cleaned and deburred in a Roto-Clone and then is disassembled.

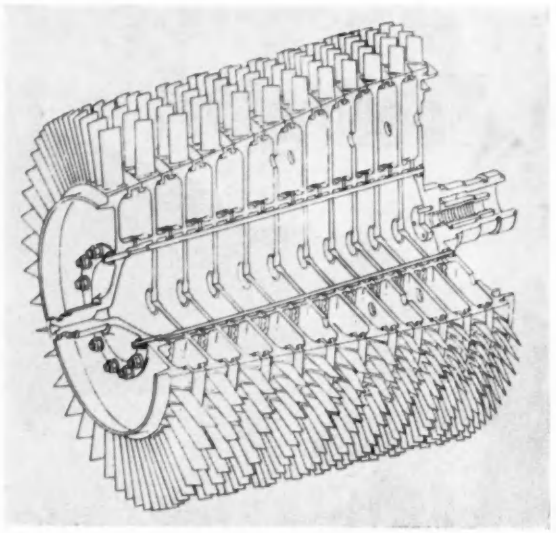
Stator rings, made in two halves for fitting in the compressor housing, are made of aluminum alloy rectangular stock. An exception to this is the first stage ring which is made of steel.

There is a total of 13 stator stages and of these stages, numbers 2 through 5 are identically machined up to a broaching operation. Stator stages 6 through 13 also are similarly machined up to broaching.

Both ends of the aluminum stock are crimped in

For drilling and reaming the 12 bolt holes in the compressor disks, a two-head Barnesdrill unit with 12 spindles per head is used.

Internal splines in the hub of number 12 compressor wheel are finished on a Fellows gear shaper, originally designed for external work, that has been redesigned with a special fixture for internal operations.



The curvic coupling method of compressor wheel assembly is illustrated around the hub of the cutaway compressor rotor assembly.

the first operation, and it is run between rollers to obtain the proper arc—within 1/16 in. Each end is milled before being set up in a Bullard Man-Au-Trol for contour machining. In this phase, both halves of the ring are set up in the same machine and machined simultaneously. The operation is completely automatic. Bullards used for this work have three main turret indexes and two side turret indexes for machining the ID and OD of the stator rings. To prevent marring finished surfaces, plastic blocks with a unique toggle arrangement are used for clamping the workpiece. These are utilized when the ring is turned over after the first Bullard operation which completes the ID and side surface and one-half of the ring's OD thickness. Rings are then deburred and identified for stage number.

At this point each stage is broached differently for blade angle and number of blades. A sine bar is used in conjunction with the Lapointe broach to determine the proper blade angle, and the machine's gear box has a manual change for establishing the number of slots to be broached in the stator ring. If the alignment is not correct, the machine's automatic cycle will not operate due to a unique pneumatic and electrical system. Both halves of the stator ring are held in a special jig as shown in the accompanying illustration. Following broaching operations, the rings are once again deburred and then are anodized.

Steel forgings are utilized for five stages of the compressor wheels; these are stages number 1, 9, 10, 11, and 12. Aluminum forgings make up the remaining seven stages. Stages 2 through 11, however, undergo similar machining operations. Due to essential difference in design, the first and last stages must undergo more detailed machine work than the other compressor wheels. Of the first and last stage, number one wheel has a spindle with an external spline

for driving certain accessories, and number 12 wheel has a hub with an internal spline for coupling to the turbine shaft. All compressor wheels are coupled to each other by a curvic coupling system wherein each wheel has teeth ground on the sides of its hub. The compressor wheels are also secured to each other by 12 bolts which run through the entire compressor disk section.

American Pacemaker lathes are brought into play for the first material removal operation on wheels 2 through 11. These lathes turn the OD and rim face of each wheel. Moving from that machine, wheels are located on the finished OD and rim face in another Pacemaker for roughing on both faces of the wheel —one side done at a chucking. This machine is equipped with a hydraulic duplicating system, and utilizes two master templates since both faces of the wheel are not of the same contour. The lathe has a constant surface speed arrangement. Wheel faces are finished on a similar machine.

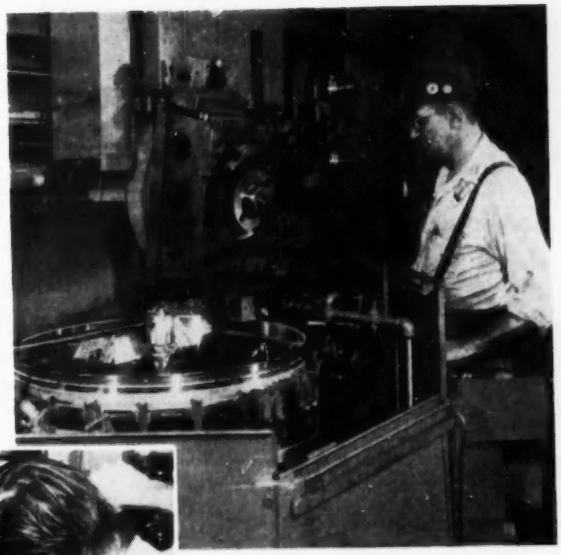
A Barnesdril unit is utilized for drilling and reaming the 12 bolt holes required in each compressor wheel. The machine is a multi-spindle, two-head unit. Wheels are then set up in another American lathe for turning the OD.

Blade-slots are broached in the wheels, after securing them in a special jig, by a Lapointe broach which has automatic indexing. Each slot is broached in one pass. Aluminum wheels, upon leaving this operation, are returned to a lathe for a rabbeting operation. All wheels are then deburred.

Curvic coupling teeth are ground on the both hubs of each compressor disk. For this operation, Gleason grinders are used on both steel and aluminum wheels. These grinders hold to a tolerance of ± 0.0002 on the teeth and grind a surface finish on the order of 20 to 30 microinches rms. All wheels then undergo both fluorescent penetrant and X-ray inspection; in addition aluminum wheels are anodized.

Blades delivered to the GE plant are ground at their base in such a manner that they can be assembled into the compressor rotor wheels with an interference fit. The OD of the blade assembly is then ground on a Van Norman unit. This assembly is placed in a special fixture equipped with a rubber blanket. Blade necks are then ground to the OD of the wheel on Oliver grinders. All workpieces are located on the ID of the curvic coupling.

Each rotor wheel is balanced individually by using modeling wax to get it in balance. The wax is then



▲ *Aluminum stator blade rings are first machined on one side by this Bullard Man-Au-Trol vertical turret lathe — note the fixture.*

◀ *In a second chucking operation, a Bullard Man-Au-Trol, equipped with special plastic blocks and a clamping device, is used to finish machine the remainder of the stator ring.*

A LaPointe machine is used to broach the dovetail blade slots in the stator ring. A sine bar is used for angle determination and the machine has a manual change gear box for indexing the number of slots to be broached.

A battery of Lapointe machines is utilized for broaching blade slots in compressor wheels. Note the special fixture used for this work.

weighed and any wheel out of balance is machined on a Nebel lathe. Machining is done on the ID of the rim. Metal removed by the lathe is collected and weighed until it is within ± two gm of the wax weight.

Initial machining operations on the first and last rotor wheels are performed on their rim face and three air seals are finished on the aft side of number 12 wheel. The front radius and curvic coupling radii also are finished in succeeding phases of production. This operation is being carried out on a Gisholt 5L turret lathe—with manual index—which feeds to stops.

A trepanning operation is performed to rough out the bore of the hub on the number 12 wheel before it is passed on to a dual-slide American duplicator lathe for rough facing the hub side of the wheel. Single-slide Americans are used, with duplicators, for roughing and finishing the front side of the disks.

Drilling and reaming operations are then carried out on the first and twelfth wheels for the 12 bolt holes. This operation is performed on a Barnesdril unit and is similar to that done on stages 2 through 11. Next, the OD is turned on American lathes and grinding operations are carried out on the shaft of number 1 wheel and the hub of number 12 wheel. One keyway on number 1 rotor and two keyways on number 12 rotor are milled on a special GE designed machine.

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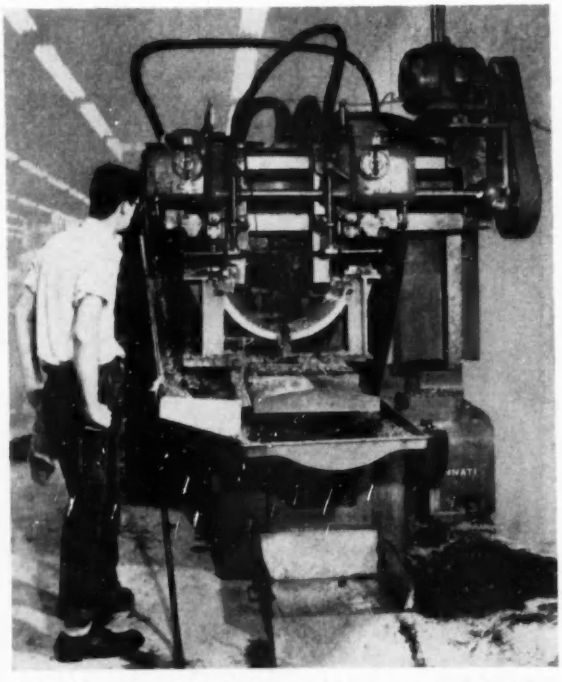


Used for milling the joint faces of the compressor housing shells, this Cincinnati Hydromatic also mills a keyway in the shell to prevent stator ring rotation.

News of the MACHINERY INDUSTRIES

By Thomas Mac New

National Machine Tool Builders' Association Holds Spring Meeting. Automation Featured at Westinghouse Machine Tool Forum.

Straight Line Production At Norton's New Facility

Last month the Norton Co., Worcester, Mass., officially unveiled its new $6 million production facility which will increase the productive capacity of the Grinding Machine Division. A complete line of 45 different types of precision grinding and lapping machines are to be manufactured at the plant.

One of the most significant features of the 275,000 sq ft, single story plant is that straight line production methods are being employed, as shown by the accompanying illustration. This feature together with new modern machine tools, special materials handling, and the increased floor space will increase machine tool manufacturing capacity about 50 per cent, according to Norton officials.

As a matter of interest, Norton executives stated that the firm's current backlog was divided 60-40 with the 60 per cent going for the defense program. It was also brought out that a great deal of thought is being given to the problem of automating some of the grinding equipment for the automotive industries. Automation of certain equipment is felt to be a means for large post-defense sales. The company may make a prototype automated piston cam grinder or a crankshaft grinder with automatic transfer in the near future. Automobile air conditioning also presents an interesting problem to Norton engineers. Here, the problem lies in grinding close tolerances that are necessary on the compressor.

According to Hugh T. Price, production manager, the straight line production layout has provided a means for smoother flow on the production of more that 22,000 different parts used by Norton.

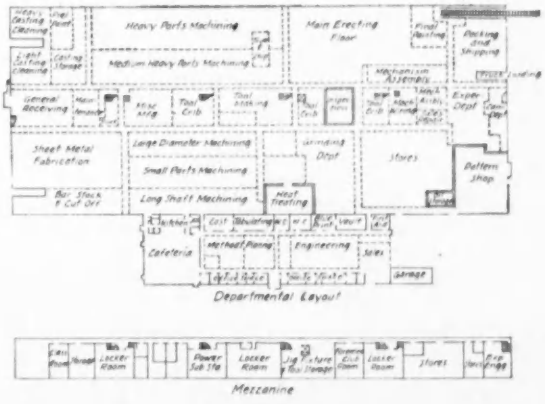
Automation, together with automatic grinding wheel truing, was discussed as sales potentials for the replacement of obsolete machines by Robert D. Lawson, sales manager.

Everett M. Hicks, vice president and manager, stated that Norton has shipped some 45,000 grinding machines since the first Norton machine was built in 1900.

Norton has recently published a book, "The Norton Story," concerning the saga of people, past and present, who by their ingenuity, productivity, loyalty, and good judgment have made the company what it is today.

NMTBA Holds 51st Spring Meeting

In his opening address at the Spring Meeting of the National Machine Tool Builders' Association held in New York City last month, Swan E. Bergstrom, President of the Association, and vice president of the Cincinnati Milling Machine Co., Cincinnati, Ohio, forecast a period of intense competition throughout American industry which will spur plant modernization and replacement of obsolete equipment. He went on to say that if the manufacturers are to preserve prosperity at home, compete successfully abroad, and maintain a rising standard of living for the people, they must provide better goods at lower prices. According to Mr. Bergstrom,



The new $6 million Norton plant has been laid out for straight line production of grinding and lapping machines.

General view of one of the five manufacturing bays of the new Norton plant. Note that supports for craneways of floor operated cranes are independent of the building structure.

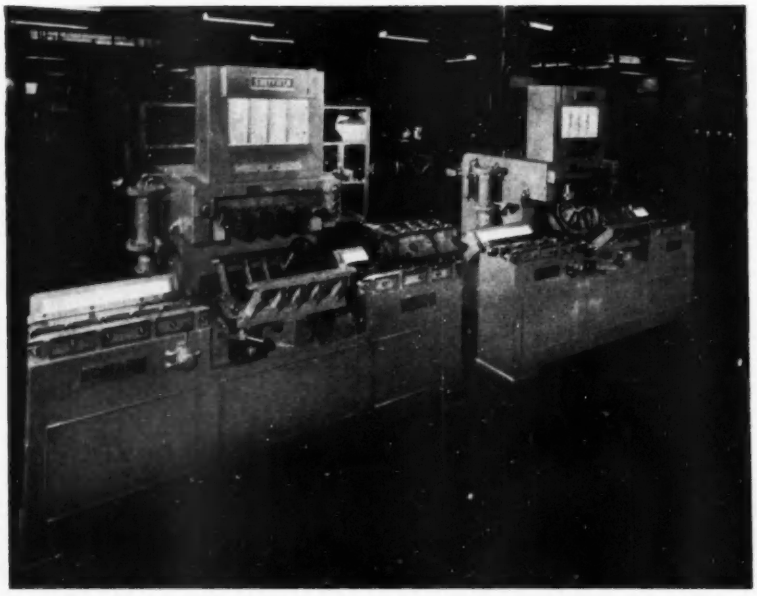
this can be done only by the use of the most modern plant equipment.

Regulations

M. A. Hollengreen, president of Landis Tool Co., Waynesboro, Pa., requested the tool builders to stick to the letter of the law as far as Regulation M-41 is concerned, and to refrain from shipping machines into Government storage. He stated that if the builders continue to ship to GSA warehouses it may prove to be a very effective argument against the use of a pool contract system when one is needed in any future emergency.

Tax Policy

Five tax proposals to protect the interests of the machine tool builders have been submitted to the Government by the NMTBA subcommittee on tax policy, headed by K. L. Finkenstaedt, executive vice president, W. F. & John Barnes Co., Rockford, Ill. In a report to the Association, Mr. Finkenstaedt named the five proposals as follows: First, improve the excess profits tax picture. The second proposal covered recommendations regarding improvements to the accelerated amortization provision which permits the issuance of certificates of necessity on emergency facilities. Third, to permit a system of optional depreciation applicable to durable productive equipment acquired after December 31, 1952. The fourth proposal recommended the elimination of double taxation of corporate earnings as soon as revenue requirements would permit. And lastly, the fifth recommendation requested amendments to clarify and make more administratively feasible a tax section regarding the surtax on corporations improperly accumulating surplus.



Two Sheffield cylinder bore gaging and classifying machines are being used in the main Dodge plant to check bores of the new V-8 engine.

Imports

Concerning foreign competition of machine tools on the American market, Ralph J. Kraut, president and general manager, Giddings and Lewis Machine Tool Co., Fond du Lac, Wis., stated that the foreign volume of business is about five per cent of the output of American machine tool producers. He stated that in order to meet competition, he personally would be willing to give up the current 15 per cent tariff protection in exchange for the elimination of restrictions on our own foreign trade abroad.

Vance Report

Talking on the Vance Committee report, Ralph S. Howe, executive vice president, the New Britain Machine Co., New Britain, Conn., said that

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Premature Announcement of Indictment

A Statement by Oscar L. Bard, President, Michigan Tool Co.

Obviously it is impossible for us to answer specifically details of the complaint and indictment until we receive copies of these documents. (Concerning the indictment by a Federal Grand Jury in Detroit April 14 charging Michigan Tool Co. with violation of the Sherman Anti-Trust Act.) So far, we have not been able to obtain them and have been informed by the Government attorneys in Detroit that no copies are available in the city.

In view of this, we are extremely resentful of the issuance of a highly misleading press release in Detroit which contains numerous inferences that the activities of this company are in some way either interfering with or impairing the defense effort or that any of our contracts were illegal.

(1) The inference that Michigan Tool Co. has ever restricted defense production is asinine on the face of it. The longest deliveries we have ever had on our shaving machines even during the peak war effort was four to five months where other machine tool manufacturers were two to three years behind on deliveries. Our delivery situation today is as near current as it ever has been in peace time.

(2) Our patent licensing contracts were voluntarily furnished to the Department of Justice for review as long ago as January 25, 1945. More than five years ago, all these contracts were reviewed by the anti-trust division of the Department of Justice and our attorneys requested that we be advised of any phases of these contracts which the Department might object to. No criticism was ever received from the Department.

(3) Michigan Tool Co. has never refused to grant a license to anyone anywhere in the 38 years of its existence.

(4) Our business is conducted on a highly competitive basis.

We are definitely resentful of the high handed procedure of issuing a press statement implying the contrary of these facts and at the same time making it impossible for us to even study the charges. It seems to us that this is just another instance of attempting to "convict" a company in the public eye through the press and radio before it has even had an opportunity to defend itself.

NEW EQUIPMENT PLANT • PRODUCTION

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 81

22-Station Transfer Machine for Cylinder Blocks

A special Transfer-matic machine tool just delivered performs 188 operations on a tractor cylinder block.

This machine mills the distributor boss; drills, bores and spotfaces the distributor hole; drills, chamfers and reams tappet holes; drills crankshaft and miscellaneous oil holes; drills and reams oil filter and dipstick holes; drills, chamfers and taps the cylinder head, distributor mounting, oil pan and bearing cap holes and also taps certain oil holes.

All operations are performed at the rate of 72 pieces per hour at 100 per cent efficiency. The machine has 22 stations—one for loading, 15 for machining and six are idle. A machine tool control unit is incorporated to automatically stop the machine when any tools need changing. *Cross Co.*

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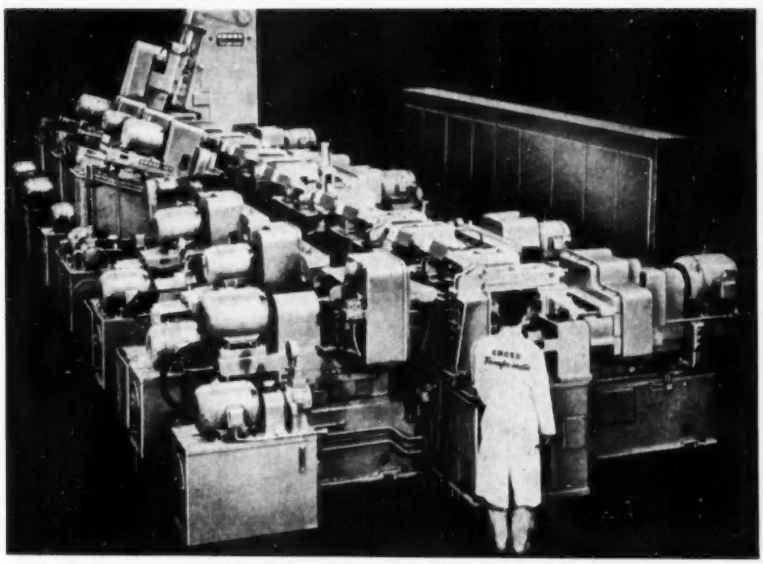

Cross transfer machine for cylinder blocks.

Console Indicator Logs 200 Temperature

The recently developed electronic console indicator is claimed to save panel space and permit an operator to scan up to 200 thermocouple temperatures as fast as he can log them. This console unit consists of an executive-type desk with a mounting which houses a specially-adapted Speedomax indicator and flanking switch panels. The mounting extends only 13 in. above the desk to give the operator an unobstructed view of the main control room panel—even when he sits as close as six or eight ft to the panel. This feature makes it easy to follow graphic panel diagrams during heat-balance checks, to compare the values of panel instruments, or to spot the location of non-recorded temperatures.

Leeds & Northrup console indicator.

The electronic console indicator unit incorporates the Model D Speedomax indicator in a special housing that has been designed so that it can be pulled out on tracks from the center of the console mounting. Because the console housing slopes at 60 deg, a seated operator can readily read the 25½ in. drum-type scale. Balancing time is four sec full-scale, 2.5 sec half-scale. The scale on the electronic console is calibrated for single or double ranges. *Leeds & Northrup Co.*

Circle E-2 on page 81 for more data

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NEW EQUIPMENT — PLANT · PRODUCTION

For additional information, please use postage-free reply card on page 81

(Continued from page 75)

Hydraulic Press for Shell-Forging

A 500 ton hydraulic drawing and forming press has been specially designed for cold drawing and nosing artillery projectiles. This press is part of a radically different shell-forging process representing a compromise between hot forging methods and steel extrusion processes. The die space has been made smaller than standard, the intense pressure developed in this process requiring less area.

There is no piping in the main hydraulic circuit of the press. All high pressure fluid is conducted through short, direct passages drilled in the structural parts. This particular press, in fact, is a "double pipeless" type, having two pipeless units for increased operating speed. *American Steel Foundries, Elmes Engineering Div.*

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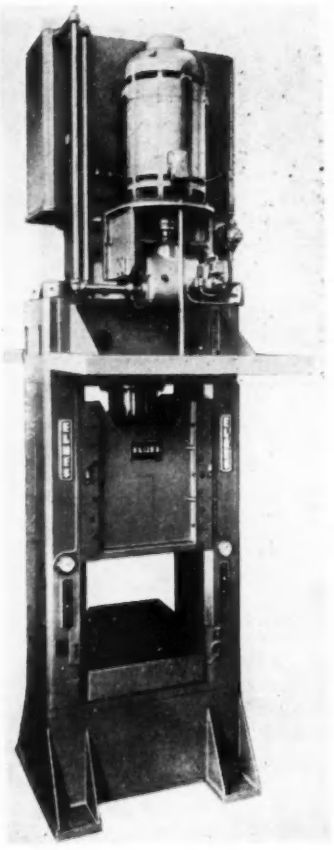


Elmes pipeless hydraulic press for shell-forging.

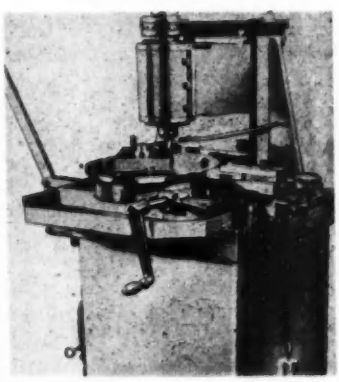
Two Tumbling Barrels Added to Line

Two more Blastmaster barrel sizes, Model 3GN of three cu ft and Model 18GN of 18 cu ft, will include all of the eight construction features found in the other available sizes. One of these features is an abrasive-tight door. This door is of all metal construction laminated with a rubber back to protect it from flying abrasive. Its side edges have rollers which travel in a mechanical labyrinth. The door moves up and down like a window curtain, operated by a crank which winds or unwinds the roller. It is held in any position by a ratchet and brake on the roller. Another Blastmaster feature is a heavy rubber curtain located between the door and the area in which the blasting takes place. This curtain protects the door from flying abrasive and prevents castings from damaging the door. One end of the curtain is attached to the door and the other end to the roof deck. The curtain rolls up and down with the door, weighted by a free metal roller which holds it in position while blasting is taking place. The work conveyor drive on the barrel has been provided with automatic torque throw-out arm protection to eliminate the possibility of damage to the equipment in case of jamming. Power for the work conveyor drive is supplied from a separate motor through V-belts to a spur type reducer mounted directly on the work conveyor top shaft. Anti-friction roller bearings have been applied in the Blastmaster Barrel at all points where shafts must carry loads. *Pangborn Corp.*

Pangborn's latest Blastmaster Rotoblast barrel.

Circle E-4 on page 81 for more data

Profile Mill



Currently available is a profile mill for precision milling of profiles, irregular shapes, hexagons and geometric forms. It will hold dimensional relations to a single dimension tolerance according to the maker.

Cams and fixtures used on the profile mill are built to customer specifications. The cam, precision machined, is made to a maximum capacity of machine, establishing a ratio-relation to the machined part. (Spike Mfg. Co.)

Circle E-5 on page 81 for more data

Jig Borer Has Two Separate Measuring Units

The No. 2E jig borer has been added to the Electrolimit series of jig borors. Featuring the Electrolimit measuring system and preloaded ball roll quill, the 2E is capable of locating and machining to tenths.

This machine employs two separate Electrolimit measuring units, one for longitudinal and the other for transverse movements. Both measuring units are independent of traversing screws. Each unit obtains basic one in. spacings electromagnetically from a solid notched master bar and registers a zero reading on an indicating meter without making physical contact. Fractional inches are obtained by moving a small electromagnetic head by means of a micrometer head graduated for easy reading to 0.0001 in. Since a 1/32 in. movement of the 4½-in. diam micrometer thimble represents a setting change of 0.0001 in., smaller estimated settings are possible.

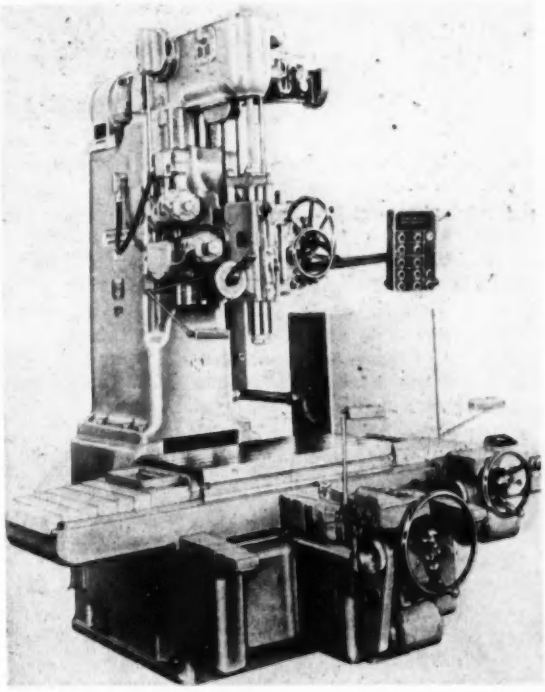
The precision preloaded ball roll quill roll-feeds on 288 precision balls preloaded between the hardened quill and liner with a total bearing pressure of 6000 lb. Head bore is provided with a hardened and ground steel liner, deep frozen for assembly and precision lapped in place. The quill is hardened, precision ground and draw lapped for accuracy.

This jig borer has electronically controlled milling feeds infinitely variable from one to 15 ipm. Rapid power travel of 60 ipm is also provided. There are eight selective spindle feeds ranging from 0.0005 to 0.015 ipr, both up and down. Twelve spindle speeds ranging from 37 to 1800 rpm are provided through a gear box and four speed motor.

Ample working space is provided with a 22 by 44 in. table; travel is 36 in. longitudinally and 22 in. transversely. Maximum height between table and spindle end is 27 in. Special columns six or 10 in. higher than standard can be furnished.

Other features included in the 2E jig borer are: centralized control zone with push button control box adjustable for height, open side design for handling large work pieces, precision hand scraped bearing surfaces, automatic pressure lubrication and telescoping chip guards on all bed and carriage ways. *Pratt & Whitney, Div. Niles-Bement-Pond Co.*

Circle E-6 on page 81 for more data



P&W 2E jig borer.

Machines for Measuring Diameters

Floating carriage diameter measuring machines are the latest additions to a line of precision instruments. They are available in three models of different capacities; up to four in. with eight in. between centers, up to seven in. with 12½ in. between centers and from six in to 12 in. with 14 in. between centers. The machines check all diametral thread elements.

In principle the machines consist of a cast iron base mounting two accurately aligned and adjustable centers. At right angles to the axis of the centers is a freely moving measuring carriage mounted on balls in vee ways and carrying a micrometer and highly sensitive reference point indicator. This carriage permits measurements to be taken along the center line and at right angles to the work.

The micrometer unit has a large anti-glare matt chrome drum, with clearly defined graduations. A vernier scale enables direct readings to 0.00001 in. Non-rotating anvils are fitted to the micrometer in order to minimize wear at the point of contact. Reference point mechanical indicators enable the thread elements to be measured to within 0.00001 in. irrespective of the "feel" of the micrometer. They are of the latest "over run" type which will not easily suffer damage by excessive pressure or rough handling. The indicators incorporate a fixed line and pointer giving a magnification of 350 to 1 on the movement of the micrometer anvil. All measurements are made against a known plain cylindrical standard. *Sheffield Corp.*

Sheffield diameter measuring machine.

Circle E-7 on page 81 for more data

(*Turn to page 78, please*)

NEW EQUIPMENT PLANT · PRODUCTION

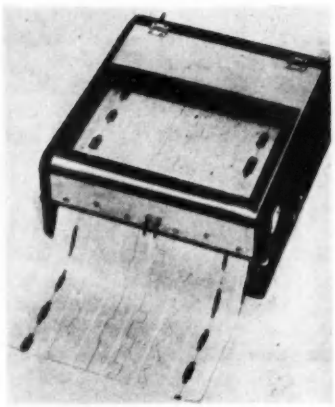
For additional information, please use postage-free reply card on page 81

(*Continued from page 77*)

Six-Channel Oscillograph

A portable six-channel oscillograph, designed for use where the need for a lightweight, compact and portable instrument is of prime importance has been announced. The model BL-226 oscillograph is equipped with six Model BL-902A penmotors which permit the simultaneous recording of six channels of instantaneous electric phenomena, or mechanical phenomena that can be converted to electrical phenomena in the frequency range of dc to 100 cps.

A large window in the top of the instrument permits viewing the chart as information is being recorded. Controls provide starting, stopping and selection of chart speeds of five, 25, and 125 mm per sec. A 25-ft length of cable and junction box provides all the necessary outlets for connecting six amplifiers.



Brush six channel oscillograph.

As an accessory, a remote control box is provided, permitting the operator to start and stop the chart drive from remote locations. Outlets are provided in both the oscillograph and control box to permit use of a floor switch. *Brush Electronics Co.*

Circle E-8 on page 81 for more data

Gear Finishers for Shaving Large Gears

Large gears—up to 15 ft in diameter and with up to 48 in. face width—can be finished on a line of standard vertical large-gear shaving machines recently introduced. The machines can be used for spur, helical, or herringbone gears, internal or external with or without integral shafts.

Introduction of this line of standard machines is claimed to provide the following advantages:

(1) Reduction in lapping.

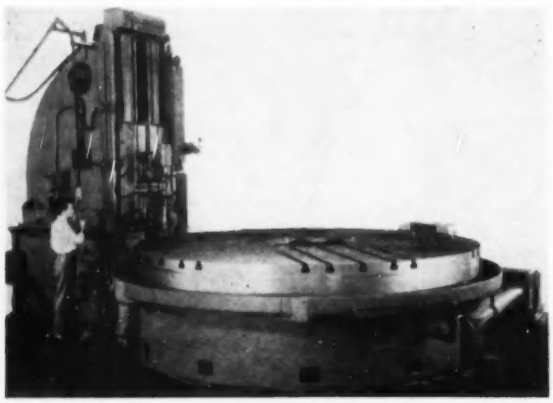
(2) Reduction in finishing time.

(3) Ability to produce accuracies down to a few tenths of a thousandth on 15 ft gears.

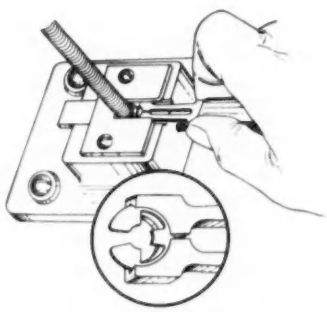
(4) Use of multiple thread hobs.

The Michigan V-series standard machines are available in four models having respectively 48 in., 72 in., 120 in. and 180 in. gear diameter capacities. They are designed for high versatility and are provided with facilities for mounting of intergral gear checking accessories, making it possible to check gears before removal from the finishing machine. *Michigan Tool Co.*

Circle E-9 on page 81 for more data



Michigan V-180 which is capable of shaving internal and external gears up to 15 ft diam.



Waldes Kohinoor Truarc E-ring dispenser.

Dispenser for E-Rings

To accommodate mass production assembly requirements, a Truarc dispenser which is said to make possible faster, more effective handling and assembly of E-retaining rings—Series 5133, has been brought out.

The dispenser unit consists of a machined weighted base that can be secured to the top of a bench or assembly table. Truarc E-rings are supplied stacked on rods (in sizes 9 through 50) which fit into the base. Rod is locked into position and rings line up ready for extraction, one at a time, with a Truarc applicator.

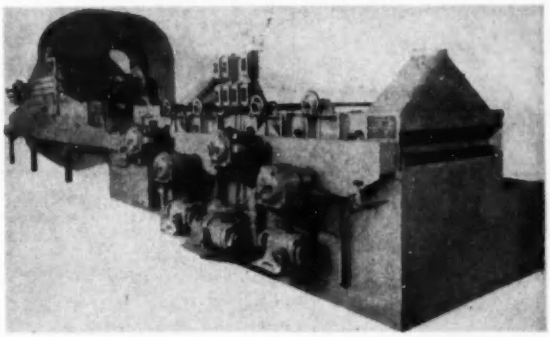
As the ring is extracted an actuating slide immediately feeds a new ring into position. *Waldes Kohinoor.*

Circle E-10 on page 81 for more data

Lubricant Applicator for Sheets and Blanks

A Drawcote applicating machine, designed especially for the application of lubricants to sheets and blanks, has been announced.

This automatic machine with Drawcote, the maker's dry lubricant, is said to reduce stock preparation costs and speed production in many metal forming operations. Material can be processed through this machine at speeds up to 55 fpm. Three separate operations are performed. Sheets or blanks to be coated enter the washer unit. Here rotary brushes clean the stock with an alkaline cleaner.



Gilron Drawcote applicating machine.

Cleaned stock then enters the self-contained coating unit where it is handled in a horizontal position. The steam-heated, fully enclosed solution tanks can handle blanks up to 48 in. wide. The manufacturer states that this unit assures even, sure coating for maximum drawing compound economy.

After coating, the stock enters the drying element which is available with steam, gas or electrically-heated ovens. It is claimed that this dry coated material is clean and easy to handle, that it can be safely stored for long periods and then formed with no need of additional lubricant. *Gilron Products Co.*

Circle E-11 on page 81 for more data

Box Type Crown Construction Trimming Press Line Available

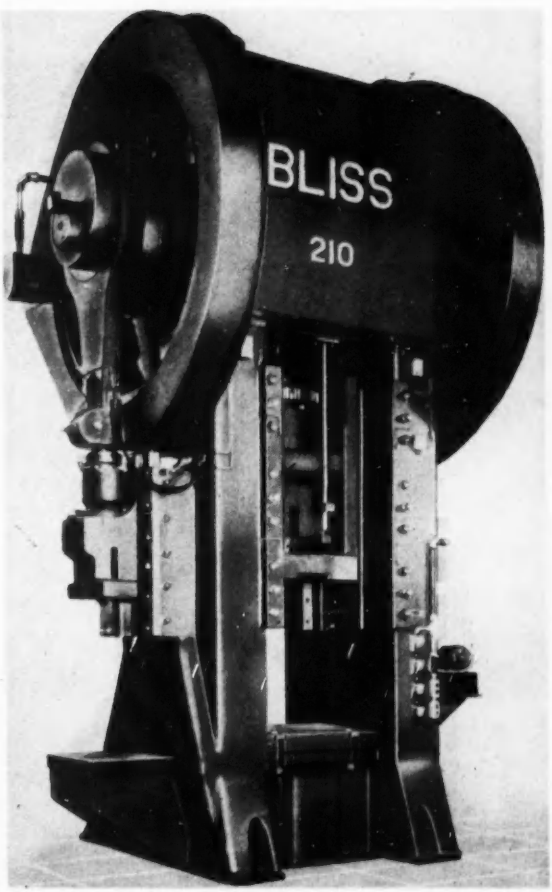
Development of a line of trimming presses, featuring streamlined box-type crown construction, has been announced. These presses are said to be especially designed for rigidity and quietness of operation.

The single-geared presses in the line are of four-piece frame welded steel construction with twin herringbone driving gears running in oil and equipped with rim-type, oil tight gear guards.

Among the features of the trimming press illustrated are an air counterbalance concealed in the uprights, automatic lubrication and a fast-acting, cool-running friction-type clutch. Another important feature of this press is the friction clamp slip-type knockout which is claimed to prevent accidental breakage of dies, or other parts, by permitting the friction clamp to slide on the knockout bar whenever the bar has not been adjusted to the proper height.

The press operates at a speed of 35 strokes per min with ram capacity of 440 tons. The slide has a 16-in. stroke with a motorized adjustment of six in. and the trimming attachment has a 10-in. stroke with a four-in. adjustment. The press is 18 ft high, has floor space requirements of 94 in. by 86 in. and weighs approximately 98,000 lb. *E. W. Bliss Co.*

Circle E-12 on page 81 for more data



Bliss trimming press, Model 210.

NEW PRODUCTS

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 81

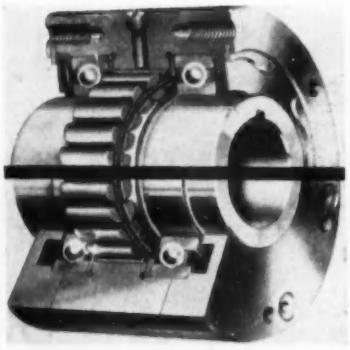
Hydraulic Multi-Range Flow Control Valve

Recently announced is a multi-range flow control valve for metering or controlling the oil flow in a hydraulic system needed for a particular job. It is designed for operating pressures up to 3000 psi and is offered in two- and three-port types in ¼, ⅜ and ¾ in. sizes for mounting.

Since the unit is the pressure-compensating type, oil flow can reportedly be maintained at a uniform rate regardless of circuit pressure variation. Featuring a two-way adjustable orifice, it is said to provide not only complete regulation of flow within a given range, but also a choice of ranges for low- or high-volume systems.

In addition to being adjustable in length, the width of the orifice can also be varied. To change the range, the screw is turned outward, releasing the spool. The single-cartridge type spool may then be rotated in increments of 180 deg. *The Denison Engineering Co.*

Circle P-6 on page 81 for more data



Sprag Assembly for Over-Running Clutches

Recently developed is a centrifugal throwout sprag assembly that is said to make it possible for over-running clutches to operate at speeds exceeding 3000 rpm. Any possible rubbing between the sprags and the inner race is reportedly eliminated.

The new feature is available in the manufacturer's all-purpose ball bearing clutch — a standard model with eight possible variations. Construction of the clutch consists of four basic parts: outer housing; inner race; full complement of sprags; and energizing springs. The manufacturer's catalog lists three standard clutch models with 19 variations.

The sprag principle is said to provide an infinite number of gripping positions and eliminate backlash. Maximum torque capacity (for size and weight) and long life (changing contact points) are other advantages claimed for the sprag type of clutch construction. *Formsprag Co.*

Circle P-7 on page 81 for more data

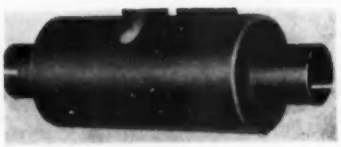
Wire Thread Inserts in Various Sizes

Now on the market are 47 standard sizes of wire thread inserts—five in the Automotive Spark Plug Series, 17 in the National and Unified Coarse Thread Series, six in the National Pipe Thread Series, 15 in the National and Unified Fine Thread Series, and four in the Aviation Spark Plug Series.

Although intended primarily for use in original equipment manufacture (OEM), these inserts are also used in production salvage as well as maintenance operations.

Available in aluminum, magnesium, iron, steel, brass, bronze, fiber, wood, and plastics, these inserts are said to provide high loading strengths and excellent resistance to wear, vibration, seizing, galling, and corrosion. *Heli-Coil Corp.*

Circle P-8 on page 81 for more data



Resonator for Passenger Cars

Recently marketed is a small dual-chamber resonator for all makes of automobiles. Installed behind the main muffler in the tail pipes, it is said to give a soft tone to the exhaust without harming car performance.

The unit is eight in. long and 3¾ in. in diameter, with inlets and outlets designed to fit all tailpipes. *Porter Muffler Mfg. Co., Inc.*

Circle P-9 on page 81 for more data

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FREE LITERATURE

Testing Machine

Bulletin 4202 describes Model FGT Baldwin-Emery SR-4 testing machine. It has a 50,000-lb load capacity, an electric weighing system, and an electronically controlled loading mechanism. *Baldwin-Lima-Hamilton Corp.*

Circle L-1 on postcard for free copy

Seamless Tubing

Bulletin TB-340 is designed to aid the user in determining whether he should employ hot finished, cold drawn, or roto-rocked seamless mechanical tubing as the basis for his product. *Tubular Products Div., The Babcock & Wilcox Co.*

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D-C Power Sources

Catalog No. E651 describes the manufacturer's line of Nobatrons which provide regulated d-c power sources for test equipment in the automotive and aircraft industries. *Sorenson & Co., Inc.*

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Electrical Connectors

Catalog D-1 on electrical connectors and wiring assemblies for aircraft, ordnance, and electronic equipment now includes a page on new M-7500 hermetically sealed connectors. *Monowatt Dept., General Electric Co.*

Circle L-4 on postcard for free copy

Production Facilities

Now available is a booklet describing the manufacturer's history, production facilities, and lines of engines, railroad and industrial items, and materials handling equipment. *Buda Co.*

Circle L-5 on postcard for free copy

Materials Handling

Ready for distribution is a 38-page illustrated booklet on the manufacturer's extensive line of materials handling equipment. *Yale & Towne Manufacturing Co.*

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Heavy Presses

Problems involved in the design and construction of 35,000 and 25,000-ton presses for the Air Force are described in a special issue of the "Newsletter." *E. W. Bliss Co.*

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Industrial Furnaces, Special Machines

Booklet No. 127 describes the manufacturer's facilities and equipment for designing, engineering, and constructing complete industrial plants, production lines and special automatic machines, and industrial furnaces, ovens, and dryers. *Continental Industrial Engineers, Inc.*

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(Please turn page)

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L-3	L-9	L-15	L-21	E-3	E-9	E-15	E-21	P-3	P-9	P-15	P-21	P-27	
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L-5	L-11	L-17	L-23	E-5	E-11	E-17	E-23	P-5	P-11	P-17	P-23	P-29	
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Hydraulic Pumps—Motors

Now available is an engineering data book on a line of large capacity oil hydraulic pumps and motors. Units are available in ten sizes with capacities of 28 to 2300 gpm at rated speeds, and 50 to 4000 hp in the pressure range of 2000 to 3000 psi. *Waterbury Tool, Div. Vickers, Inc.*

Circle L-9 on postcard for free copy

Bar Feed

Recently released is a brochure on Model AML automatic, magazine-loading pneumatic bar feed. *Lipe-Rollway Corp.*

Circle L-10 on postcard for free copy

Bricks, Sticks, Stones

Recently released is a catalog (Form ESA-23) on abrasive rubbing bricks, abrasive and dresser sticks, scythe, jointer, sharpening, and specialty stones. *Simonds Abrasive Co.*

Circle L-11 on postcard for free copy

Protective Coatings

Ready for distribution is a 43-page booklet which discusses a wide variety of protective coatings for application to all types of products. Specifications are included. *Seal-Peel, Inc.*

Circle L-12 on postcard for free copy

Jig Borer

Circular No. 559 describes No. 2E jig borer of intermediate capacity. Complete specifications are included. *Pratt & Whitney, Div., Niles-Bement-Pond Co.*

Circle L-13 on postcard for free copy

USE THIS POSTCARD

Gas-Electric Furnaces

Catalog B-5459 covers a line of gas or electric furnaces to handle precision heat-treating problems. *Westinghouse Electric Corp.*

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Hardening Furnaces

Gas-fired, batch-type hardening furnaces are featured in Bulletin No. SC-161. Direct-fired, horizontal-hearth, circular, and rectangular salt pot types are included. *Surface Combustion Corp.*

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Industrial Heaters

Recently released is a 32-page catalog (No.1510) on standard and heavy-duty centrifugal fan industrial heaters. *Sturtevant Div., Westinghouse Electric Corp.*

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Horizontal Band Saws

Catalog No. G-52 describes a line of horizontal metal cutting band saw machines, as well as special heavy-duty saws for unusual cut-off jobs. *Wells Mfg. Corp.*

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Rubber Parts

Just off the press is Bulletin 5201A1 on custom molded rubber parts. It summarizes the company's new and expanded facilities for the production of special synthetic compounds. *Rubber Products Div., The Parker Appliance Co.*

Circle L-18 on postcard for free copy

Industrial Maintenance

Now offered is a detailed booklet on industrial maintenance. Included is a check list to aid in evaluating a company's existing maintenance program. *Wheeler Associates, Inc.*

Circle L-19 on postcard for free copy

Threading Tools

Catalog MU-153 covers such products as radial and tangent die heads, solid adjustable, machine, and pipe taps, chasers and accessories, as well as special threading tools. Copies should be requested on business letterheads. *Murchey Div., Sheffield Corp., Dayton 1, Ohio.*

Power Distribution

Publication GEA-5900 outlines the latest electric power distribution methods for industrial plants. It contains 12 ideas to aid in maintaining power continuity, reducing installation and operating costs, safeguarding personnel and equipment, and planning power systems. *General Electric Co.*

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(*See preceding page*)

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L-3	L-9	L-15	L-21	P-3	P-9	P-15	P-21	P-27	E-3	E-9	E-15	E-21
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L-5	L-11	L-17	L-23	P-5	P-11	P-17	P-23	P-29	E-5	E-11	E-17	E-23
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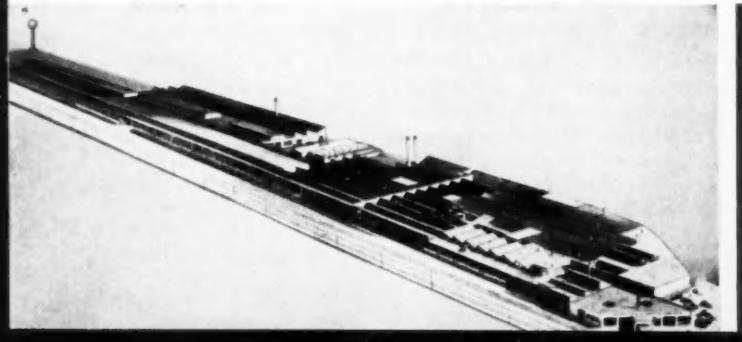

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Hermetically Sealed Connectors

M-7500 Series hermetically sealed connectors are used to give protection to circuits of hermetically sealed electronic and electrical instruments under unusual conditions. For example, they are said to withstand mechanical shock of 100 g's, thermal shock from 500 F in oil to the temperature of liquid air, temperatures as high as 1500 F (e.g., when connectors are welded to instrument housings), and a voltage breakdown of over 1000 v. They are reportedly impervious to moisture, corrosion, rare atmosphere, high pressure, fungus, and vibration.

One end of the connector is designed to mate with standard AN (MIL) types. The other end has a tapered and serrated surface so connector can be pressed into instrument housing and mechanically anchored to prevent turning.

The strength of the mechanical anchor, plus the high melting temperature of the connector's hardglass insulation, is claimed to permit use of any common method of bonding connector to housing—soft solder to welding—without the use of special assembly jigs and staking tools and without danger of breaking or melting the seal. In addition to standard models, the connectors are available with special alloy shells and mounting arrangements for unique applications. *Monowatt Dept., General Electric Co.*

Monowatt hermetically sealed connectors.

Circle P-1 on page 81 for more data

Small Pressure Relief Valve

Recently announced is a pressure relief valve of the cartridge type which is said to be insensitive to back pressure or system pressure. Now used on commercial planes by two airlines, the unit has reportedly made possible the use of a self-positioning wing flap system.

The valve is said to eliminate the effects of system or back pressure so that relief pressure stays constant over a wide range of back pressure. It is also stated that it has several special military uses. *Hydraulics Div., Pantex Manufacturing Co.*

Pantex pressure relief valve.

Circle P-2 on page 81 for more data

Manifold Pressure Valve

Recently announced is a manifold pressure gage purge type valve made of aluminum. Working parts are lubricated by the application of the Electrofilm Lub-Lok process. Weight is .085 lb. *Allen Aircraft Products, Inc.*

Circle P-3 on page 81 for more data

Keithley electronic wattmeter.

Electronic Wattmeter

Now available is an electronic wattmeter designated as Model 110. Basically an amplifier driving the potential coil of a dynamometer wattmeter, the instrument is said to offer convenience and accuracy in measuring electric power.

Features include a range from .3 to 300 w on six scales, with accessory shunts extending range to 9000 w. Frequency response from 20 to 3000 cps reportedly permits measurements at all power and aircraft freqencies with no need for corrections.

Accuracy is within two per cent of full scale; input impedance, 500,000 ohms to the potential circuit, 0.5 ohm to the current circuit, according to the maker. *Keithley Instruments.*

Circle P-4 on page 81 for more data

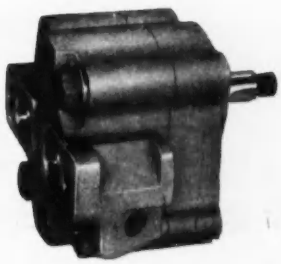
Wire Twister

Now on the market is a tool for safety wiring of aircraft engines, carburetors, magnetos, radar, etc.

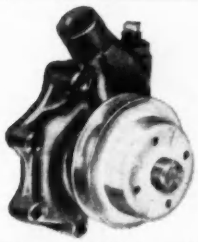
Said to be three tools in one (pliers, wire cutters, and twister), operation is quite simple. The twister is manufactured in nine and 12-in. sizes. *Ralph C. Robinson Co.*

Circle P-5 on page 81 for more data

parts you can take for granted



FARM IMPLEMENT PUMP



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SPECIAL PRODUCTS DIVISION

METALS

Tungsten Now Appears To Be in Ample Supply. Price of Copper Expected to Decline. Tin Goes Below $1 per Lb.

By William F. Boericke

Steel Output Continues at Peak Capacity

The verdict is virtually unanimous in the steel industry that present business is excellent and the Korean peace overtures thus far have not dulled the appetite of consumers to buy every ton of steel now available. Demand through the middle of April has seemed insatiable, with hot and cold rolled sheets and strip especially sought for. All this in spite of the greatest production during one month in steel history with 10 million tons output in March.

Indicative of the belief of consumers that steel will continue to be hard to get well into the third quarter is the strength of the conversion market, where quotations may be two or three times the mill price. No doubt some orders are being placed in anticipation that a higher price level will prevail following union demands for more pay which are scheduled to reach the negotiation stage in May.

However, there is considerable doubt about any immediate advance in steel prices. Almost certainly there will be none except as compensation for wage increases. This isn't to say that steel men don't feel they are entitled to a higher price level. But aside from the feeling it would embarass the Administration at this time, most steel men are not quite so confident as the automobile manufacturers that production at 100 per cent capacity is to continue indefinitely. Over the longer term, that is through the fourth quarter, there's optimism, but it's qualified.

Sobering Signs

The automobile industry is the mainstay of steel, taking 16 per cent or so of the total output. Some steel producers wonder how long the present production rate in Detroit can continue. There is a plentiful supply of used cars and repossession of cars appears to be increasing. If dealers inventories of cars pile up, there'll be cutbacks in production in Detroit and steel cancellations will follow. And once demand weakens, steel prices quickly reflect market conditions. Lead and zinc producers will bear testimony to this.

Steel scrap has been in ample supply for months, but prices have remained firm until April when secondary grades suddenly softened $3 per ton. At the same time buyers began to insist on better quality from dealers. With the opening of the Lake shipping season, it is thought the price may slide further.

Capacity Gain in Six Principal Steelmaking Districts Since 1939

Finally there is the psychological effect of a real Korean truce on general buying. It is likely there will be more caution about future commitments and plant expansion until it is known how normal markets will take expanded plant facilities.

Steel production is at peak and steel company profits in the first quarter will make good reading. But this finds no response in Wall Street, where steel stocks have continued to slip. The considered judgment of the financial community is that more competitive days are ahead and an inventory recession appears indicated for the second half of the year.

Plenty of Tungsten

Tungsten, only a short time ago listed among the scarcest metals, now appears to be in ample supply. With a guaranteed price of $63 per standard unit by the Government for domestic ore, domestic output increased 15 per cent in 1952 and imports of tungsten concentrates jumped 126 per cent. The world price of tungsten has declined from a peak of $65 to $40 per unit and is not so strong at that. Any permanent truce with Red China with resumption of trade would almost certainly bring the world price below $30 per unit. Domestic producers have no worry until 1956 when the Government purchase agreement expires. Their output goes into the strategic stockpile. Since the first of the year the foreign price has dropped about $10 per unit.

Lower Copper Price Ahead

After over a month of utter price confusion, domestic copper producers finally stabilized their price at 30 cents per lb. This involved increases by Kennecott and Phelps Dodge from the prices they originally set of 27½ cents and 28½ cents respectively, and a de-

(*Turn to page* 122, *please*)

LONG LIFE!

1

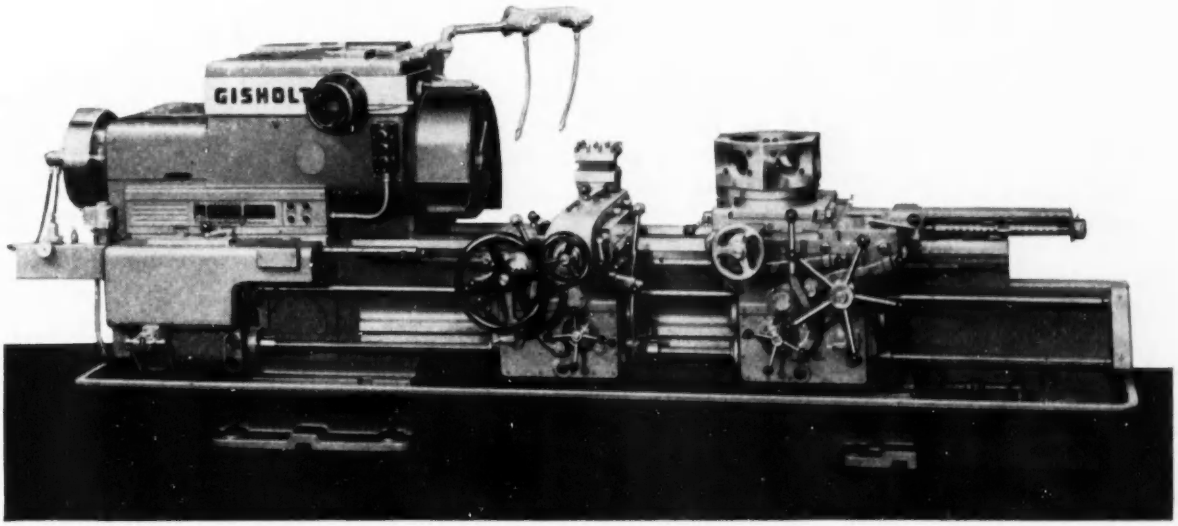
All gears in Gisholt turret lathe transmissions are high carbon alloy steel, precision ground after heat-treatment to assure long wearing quality. All shafts turn on antifriction bearings, with pressure spray lubrication. Headstock is cast integral with bed for extreme rigidity—to maintain accurate, permanent alignment.

2

Gisholt's thick, block-type ways are automatically pressure lubricated. Made of SAE 52100 tool steel, they are deep hardened to 64-66 Rockwell C and then finish-ground for exact alignment with the spindle. On top, bottom and both sides, they present a bearing surface that is virtually wear-proof—accurate for years to come.

3

Aprons are fully enclosed, all working parts protected and operating in a continuous cascade oil bath. Alloy steel gears and shafts are mounted on antifriction bearings. Positive serrated feed and traverse clutches cannot slip or drag. Safety shear pins protect feed and traverse mechanism against overload and accident.



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Observations

By Joseph Geschelin

Sport Cars

Although our own leanings are strictly along the lines of a big, high-powered sedan for getting around, we do not discount the current interest in sports cars. As a matter of fact, we are inclined to believe they will enjoy a bigger market than one might expect on conservative estimates. Consider just a few bits of proof. The GM Motorama at the Waldorf-Astoria drew an attendance of 306,000 people during its seven-day billing in New York. When the big Show moved to Florida, attendance in Miami was all of 321,500 people for a seven-day stand. More recently, when GM showed its four special sports cars in Detroit, the GM Building lobby was packed with enthusiasts every day. Naturally not many in the crowd could afford these cars as they are priced today. But it seems a good bet that in a country containing over 160-million inhabitants there are enough enthusiasts with the necessary funds to make sports cars big business indeed.

Solar Furnace

High temperature research, using Solar rays, is being conducted at Rockhurst College, Kansas City, Mo., according to a recent report from Alcoa. They are using a 120-in. parabolic aluminum mirror, manipulated to reflect and concentrate parallel rays from the sun into a solar furnace. It results in a beam ⅜-in. in diameter, approaching a temperature of 6000 C.

Power Steering

With five different types of power steering already on the market, there is little doubt that it's going to be a big seller. In engineering circles discussion still is rife as to what type to specify: shall it have power on all the time (as on Chrysler cars); or will it be billed as more of a parking aid. Even in the latter case there are differences of opinion as to the amount of "feel" that is necessary. It is expected that these questions will be resolved over a period of time. It is also quite likely that as the public grows more familiar with power steering, and as the mechanism proves its complete reliability, the overall reduction can be progressively reduced. It would be premature to reduce the turns of the wheel very much for some time to come but it should be safe to do so later on.

Engine Blower

We found recently that a well-known maker of automotive superchargers has sold the business to a new company. The manager of the new enterprise, a friend of ours, promises that an energetic drive will be made to develop new applications and further the art through research.

Operations Research

Born of the last war, operations research looms as an important management technique. As described at the recent SAE Production Meeting in Cleveland, it provides a scientific approach to complicated problems of making sales forecasts, market studies, establishment of economic lot sizes for seasonal production requirements, and similar problems. On the other hand, management will have to decide soon whether operations research as it is practiced by outside consultants is the answer, or whether the job can be done quicker and just as surely by its own organization aided by its own statisticians and mathematicians. We are inclined to believe that the latter course will solve most of industry's problems. The main thing is to acquire the proper perspective and philosophy developed by specialists in the field of operations research.

Cold Extrusion

Cold extrusion came in for considerable discussion at the recent SAE Production Meeting held in Cleveland. This session confirmed that large parts require the use of zinc-phosphate coatings to make the process successful.

Truck V-8's

Some time ago we touched on the desirability of V-8 engines of larger sizes for truck installation. Considering the need for larger cargo space consistent with length restrictions, and considering the present trend to forward drive, the need for large V-8's has become imperative. In this connection, we found recently that one of the important truck builders is planning a heavy duty V-8 engine as part of its development program in the near future.

Truck Instruments

We hear that an SAE committee is working on a standardized instrument panel treatment for motor trucks. It would be well for the committee to entice some sales managers on the committee and get their ideas. So far as we can see there is need for reconciling purely functional objectives with the eye appeal that sales managers want in their vehicles.

Fugitive Elements

Recent bulletin from the Stanford Research Institute advises that it has acquired the newest model emission spectrograph. So versatile that it can make both qualitative and quantitative analyses, its precision makes it possible to detect impurities of only a few hundredths of one per cent of a sample.

Mystery Metal

Alcoa reports that although gallium has been available for two years, only a few minor uses have been found for this unique material. Gallium melts at 86 F but does not boil until 3600 F. Like water, it expands upon solidification. Electrical resistivity variability is believed to be greater than of any other metal. It emits electrons at extremely low temperatures. At its present price of $1,000 per lb gallium is

(*Turn to page 98, please*)

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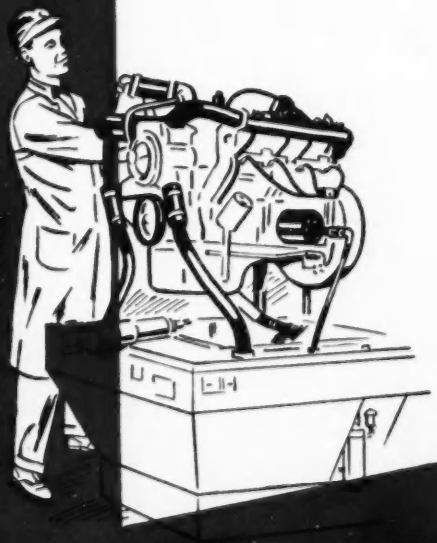


RESULTS OF 1200 Hour CYCLE TEST

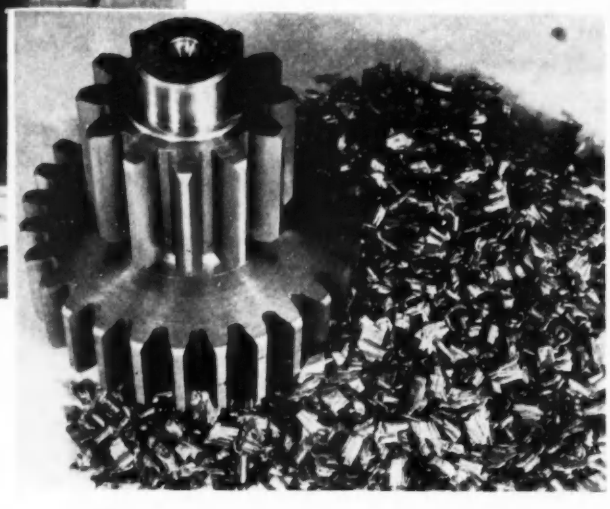
In recent cycle tests made by one of the largest automotive manufacturers, Sterling *Conformatic* pistons were fitted into a stock engine at .0005 clearance. After operating the engine for 1200 hours, approximately half of that time at full load and full throttle, *the Conformatic Pistons were pronounced perfect.*

STERLING
PISTONS

*T.M. Reg. Patent Applied for

STERLING ALUMINUM PRODUCTS, INC. • St. Louis, Missouri

Shear-Speed gear shaper forms teeth on pinion and gear of the cluster in nine min, 50 sec, removing 20 lb of metal from the 90-lb forging.



Close-up of 70-lb Caterpillar final drive gear cluster cut from 90-lb forging on a single Shear-Speed gear shaper in two setups.

Gear Shaper Cuts Production Time

PRODUCTION engineers at Caterpillar Tractor Co., Peoria, Ill., have reduced production time by over 78 per cent in addition to saving machine tool floor space in the cutting of two gears on a 90-lb, SAE 4820 steel final drive gear and pinion forging. This they do by forming the teeth in two setsups on a single machine tool.

As orginally processed, the 27-tooth, 10.372-in. OD, 2.750 DP, 20-deg PA gear on the cluster was hobbed. The smaller 12-tooth, 6.097-in. OD, 2.413 DP, 20-deg PA gear was hobbed part way, rough-shaped the remainder of the 4-3/16 in. face width and then finish-shaped the entire width. Total cutting time for these two operations was 69 min.

The teeth are now formed in nine min, 50 sec total cutting time in two setups on a model 18105 Michigan Shear-Speed shaper made by Michigan Tool Co., Detroit. The teeth on the small gear are shaped first on the Shear-Speed machine. After a production run has been produced on this operation, the fixture is changed along with the cutter head.

Then the teeth on the larger gear are formed with a cutting time of four min, 26 sec of the total cutting time. Production on the single Shear-Speed gear shaper of these final drive clusters is 31.5 pieces per eight-hr day. This compares with seven pieces per eight-hr day on six machines with the hobbing and shaping methods formerly in use.

Nash

One of the many leading engine manufacturers to select and distribute Perfect Circle's 2-in-1 chrome piston ring set for authorized replacement service

2-in-1 is the truly modern piston ring equipment, controls oil—seals compression for over twice as long as ordinary sets. Solid chrome protects both oil rails and top compression rings against wear. And only 2-in-1 offers a choice of spring pressures with each oil ring to meet any cylinder wear condition.

For sustained power and positive oil control for thousands of extra miles, always install Perfect Circle 2-in-1 piston ring sets. Perfect Circle Corporation, Hagerstown, Indiana; The Perfect Circle Co., Ltd., Toronto, Ontario.

Perfect Circle

PISTON RINGS The Standard of Comparison

COMBUSTION CHAMBER DESIGN

(*Continued from page* 60)

1. Changing the shape of the combustion chamber to the configuration in Fig. 9, primarily around the region of the spark plug, and by reducing the depth of the quench area.

2. Changing valve timing to get more power at high engine speeds.

3. More effective quenching of detonation.

4. Increasing speed of response of spark advance.

5. Changes in carburetion to provide leaner mixtures in general but with sufficient richness in certain areas of the carburetor flow pattern to prevent detonation.

Essentially, these changes contributed to the development of mechanical octanes. And this objective was aided by relocation of the spark plug to shorten flame travel.

This engine is intended for operation with premium grade fuels.

Willys-Overland F-Head-6

As seen in Fig. 10, the large diameter intake valve is housed in the cylinder head directly over the piston. The exhaust valve, on the other hand, is located in the lower wall of the combustion chamber in the cylinder block on the side. This forms the F-head valve arrangement.

Inherent advantages of this combustion chamber, according to the company, are as follows: it is of compact form with a centrally-located spark plug to effect minimum flame travel. An uncommonly large intake valve is centrally located in such fashion as to promote good breathing and high turbulence. In addition, short downdraft manifolding with even warming of the intake charge is effective for all conditions of throttle opening and engine speed as well as fast starting. The intake manifolding, of Swan type, is completely surrounded by water jacket to effect even warming of the charge under controlled temperatures.

It is claimed, too, that the engine will operate for a considerable mileage without accumulating excessive deposits of lead and carbon.

Although the engine has a compression ratio of 7.6 to 1, the octane requirement is said to be quite moderate. With proper spark setting, it is claimed that gasoline having an octane rating of 80 (motor method) and 86 (research method) will give knock-free performance, thus making it safe to operate on regular grades of gasoline.

Chevrolet

Figure 11 shows the combustion chamber for the 1953 Chevrolet Blue Flame passenger car engine, used with Powerglide. With a compression ratio of 7.5 to 1, this engine is said to operate satisfactorily on regular grades of gasoline.

The chamber is typical of Chevrolet practice, the chief difference from last year's design being a suitable reduction in volume and a narrower transfer passage to the intake valve cavity. The intake valve has been made 1/16-in. smaller in diameter to reduce shrouding of the valve by the cylinder wall. At the same time the intake valve has been

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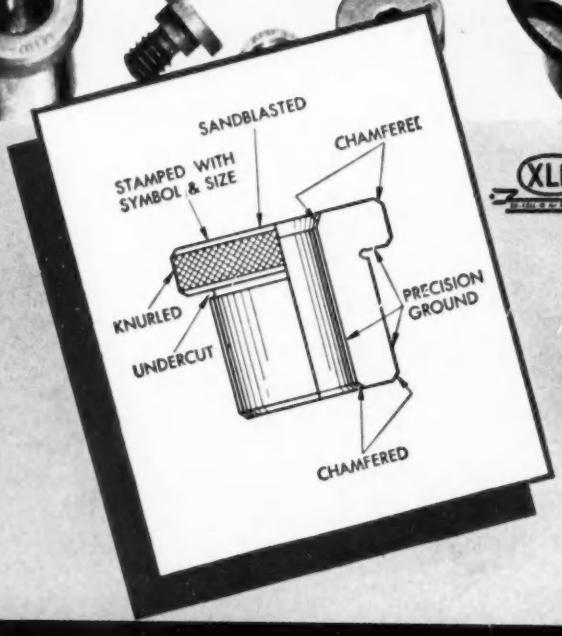

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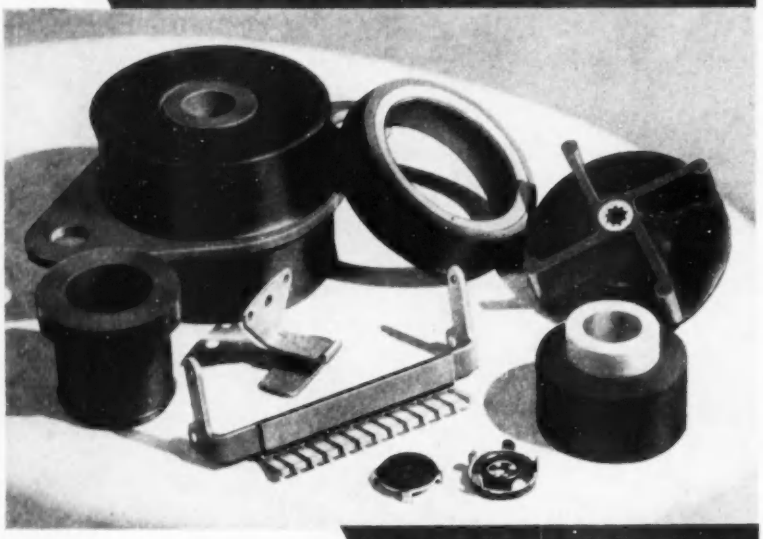

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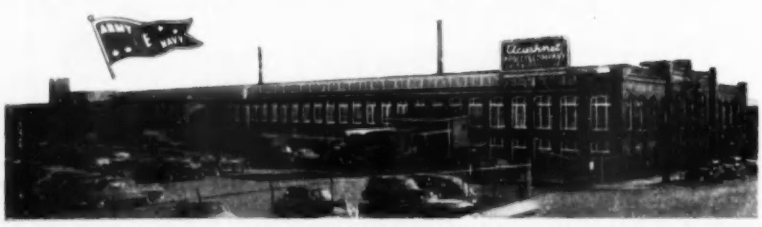


Address all communications to 754 Belleville Ave., New Bedford, Mass.

raised to maintain clearance between the valve and piston. Incidentally, for the first time in Chevrolet practice the piston in this engine is made of aluminum.

Flame propagation is said to be uniformly progressive from a more compact area, providing a smooth rise in pressure during the power stroke. Full power rating is claimed with this engine operating on regular grade fuels.

1953 Oldsmobile 98

For 1953 the Oldsmobile V-8 on the 98 and Super 88 has been upped in output to 165 hp with a compression ratio of 8 to 1. The new combustion chamber, according to Oldsmobile engineers, is notable for its compactness which is said to increase turbulence, shorten flame travel, and provide a more effective quench area.

The revised combustion chamber is shown in Fig. 12. Incidentally, Fig. 13, will be found of interest since it indicates how the chamber periphery over the piston was compacted in the process of increasing compression ratio. The dotted line indicates the periphery of the cylinder head cavity in 1952 engines.

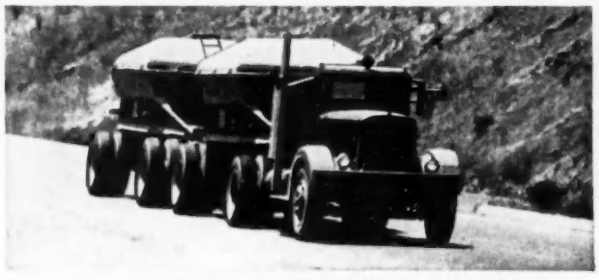
Studebaker V-8

Figure 14 shows the combustion chamber of the Studebaker 8-233 engine for the 7 to 1 compression ratio which is standard; and 7.5:1 available as optional equipment. An 8.5 to 1 compression ratio may be obtained by changing the piston height as shown at the right.

The combustion chamber is completely machined to insure uniformity of contour and volume. Contour is such that the greatest volume of the fuel-air mixture is concentrated near the spark plug. Tests have shown this design to be quite effective with regard to thermal efficiency and low spark knock characteristics. Spark plug electrodes are located in the mixture stream for maximum part throttle fuel economy. Spark advance is worked out for maximum power. A dog-leg advance curve permits lower initial spark setting at low engine speeds, resulting in lower octane requirement.

Liberal water passage surrounding the combustion chamber, to prevent hot spots, assist in reducing octane requirements, and permit operation with regular grade fuel.

(Turn to page 96, please)



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(*Continued from page 94*)

Nash Statesman

The Nash Statesman engine in its revised form for 1953 has a new induction system featuring a double-barrel carburetor which permits more even distribution of mixture. In the process of lifting engine output from 88 to 100 hp breathing capacity was increased by increasing the area of the intake manifold, by enlarging intake and exhaust valves. In addition, the camshaft was changed to provide increased valve lift.

At the same time the combustion chamber, Fig. 15, has been redesigned as shown. In connection with this illustration, attention is drawn to the fact that the cross-hatched areas indicate the changes from the 1952 design, showing the increases in valve diameter, intake port diameter, and the changes in profile of the combustion chamber.

GMC 228 Truck Engine

Although the material in this article is confined to passenger car engines, we thought it of interest to include Fig. 16 showing the combustion chamber arrangement in the new GMC 228 and 248 gasoline engines used in 1953 GMC light trucks. Patterned after the design of the GMC 302 engine, the combustion chamber is said to be the principal factor in over-all efficiency and power development of these engines.

Perhaps the most significant thing about the GMC design is that it employs a compression ratio of 8 to 1 on the 228 engine, easily among the top in passenger car practice, and yet is suitable for operation with regular service station fuels.

As shown, it features large intake and exhaust valves and ports; a flat aluminum piston, and a smooth, shallow dome shape. Improved mechanical efficiency is derived from the combination of large bore and short stroke, today a feature of the new passenger car engines.

In retrospect it is important to note one point that was not stressed in descriptions of the individual combustion chamber designs. As is well known, Cadillac, Buick, Oldsmobile, and Chrysler Crown Imperial models adopted 12-volt ignition systems in 1953. This was done specifically to provide a hot spark of sufficient intensity to assure adequate firing of the highly compressed charge under all operating conditions, particularly at speeds near top range.

This radical shift brought with it many other important advantages, such as: greater electrical capacity, higher generator output, and faster cranking speed. It seems logical, therefore, that the principle should find wider adoption as time goes on. In fact, it is doubtless a necessity to widen the application of 12-volt systems if the new ignition and lighting equipment is to be made in sufficient volume to reduce prime cost to a minimum.

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Alloy Steel SPRINGS

. . . fitted by their design and inherent quality to withstand jolting over rutted plant yards, uneven rail crossings, unpaved roads, etc. *Job*-fitted for extra stress in the BUDA drawbar pull industrial towing tractor, by Tuthill engineering specialists. Wherever there's a tough job for springs to do, a rough ride to smooth, an extra load to carry, "TUTHILLS" do it better.

Special Leaf Springs designed to meet any requirements.

Write for complete details now!

TUTHILL SPRING CO.

760 WEST POLK STREET • CHICAGO 7, ILLINOIS

Rubber Research

United States Rubber Co. has signed a conditional purchase contract for approximately 80 acres of land in Emerson, N. J., on which it plans to create a new research center devoted to basic research in the fields of rubber, chemicals, synthetics, textiles, and plastics, it was announced yesterday by company officials. The purchase price was not disclosed.

Construction is expected to begin this year, and the center will open with an initial employment of about 125. Eventually, it is expected this number will be nearly trebled.

BASED ON EXPERIENCE

modernization program at major auto plant calls for additional Clark Air Compressors

With the recent completion of another phase in the modernization program of a major auto plant, two more Clark balanced/Opposed Compressors were placed in service to supply plant air for the shops and the foundry.

Plans called for installation on the second floor of a powerhouse. This demanded vibration-free operation. Having had several years' experience with two Clark 1500 hp, CBA-4 Balanced/Opposed Compressors, plant engineers repeated their original selection — *two more Clark units*. They had already *demonstrated* their vibration-free performance and extremely low maintenance — the direct results of Clark Balanced/Opposed design and precision construction.

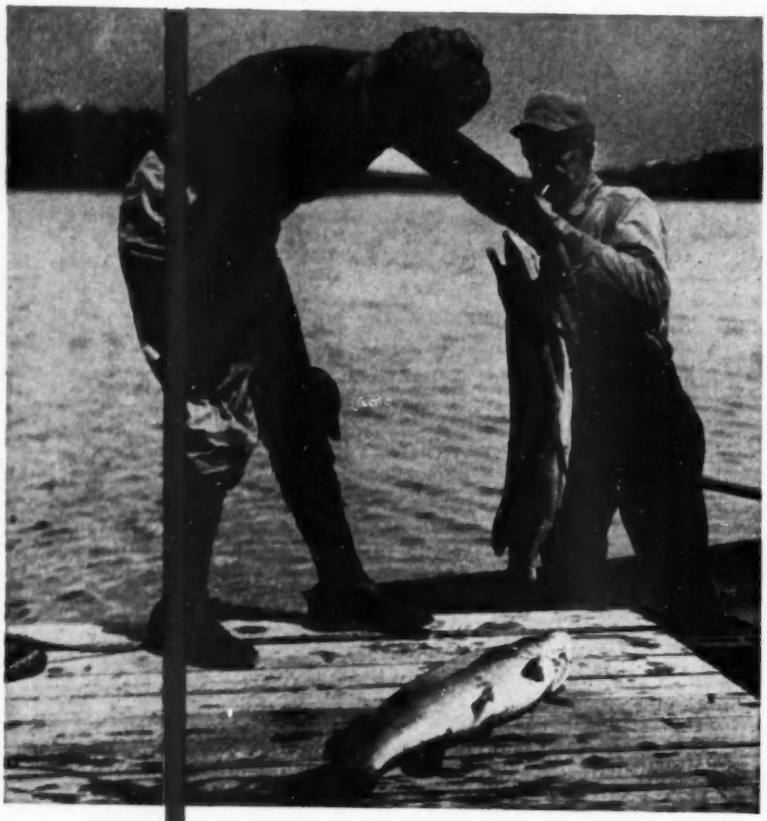
For today's expansion and modernization programs, there is a growing preference for Clark Balanced/Opposed, Motor-Driven Air Compressors — industries' *most modern* compressors. Your nearest Clark representative will furnish complete information, or write for Bulletin 118.

CLARK BROS. CO. • OLEAN, N. Y.
Division of Dresser Operations, Inc.
Sales Offices in Principal Cities Throughout the World

PRECISION BY THE TON

CLARK balanced/opposed compressors

© 1953, Clark Bros. Co., Division of Dresser Operations, Inc.



VINCO is on the job! No worries spoil his fishing!

The .6% average rejection rate on the dollar volume of business over the last five-year period is proof of Vinco dependability.

And this dependability is the reason why our friend's fishing trip is not spoiled by business worries. Aircraft gears and assemblies, radar component parts, gear pumps, and a wide variety of mass produced parts are supplied to many industries from coast to coast.

These industries are also using the technical knowledge of Vinco field engineers when in need of an efficient, practical spline gaging program.

VINCO CORPORATION
9117 Schaefer Hwy.
Detroit 28, Mich.

B-1 Formed Wheel Dressers • Gears • Spline Gages • Gear Pumps • Production Parts

The Trademark of Dependability

VINCO

MILLIONTHS OF AN INCH FOR SALE

OBSERVATIONS

(*Continued from page* 88)

pretty hard to exploit unless more useful applications are discovered. How about it, readers, can you see gallium in your future? If you can, Alcoa will thank you.

Small Cars

In the course of his presidential tour about SAE Sections, Robert Cass, SAE president, has recommended that automobile engineers consider a radical shift to real small cars in the interest of materials conservation. In his opinion, the industry has not gone far enough in this respect and he proposes a car weighing not more than 2000 lb, seating only four passengers. It should have a comparatively small engine with fuel economy in the range of 30 to 40 mpg. If conservation of natural resources is taken as the sole criterion, it would dispose of such questions as: does the public want this kind of transportation; and can such a car be built cheaply enough to justify its introduction.

Large Engines

It appears that some military vehicles may require engines of around 500 hp output. Just as it happened before the last war there is no requirement in normal industrial activity for high speed automotive engines of this size. And no such engines are readily available. On the other hand, quite a number of water-cooled V-12's were built for the Air Forces and for the Navy during WWII. Perhaps one or more of these engines could be revived and modified for the purpose, assuming that tooling still is in existence.

Steering Types

Power steering, having exceeded all expectations as to its acceptance by the public, is due for wider adoption as well as an increase in types and makes. The linkage or booster type arrangement, featured by Packard and Nash for 1953, is being readied by several steering gear manufacturers besides Monroe and is expected to find adoption on some makes of cars not now offering power steering. If the present plans materialize as expected, most makes will have power steering as an op-

(*Turn to page* 101, *please*)

1903 1953
FIRST FIFTY YEARS
CLARK EQUIPMENT

CLARK

Here's a new and practical approach to an old problem . . . Instead of designing a machine to use an axle of existing pattern, why not design the machine *to meet the necessities of its job*—and then design a power-transmission *especially for that machine*. That's what Clark does; and that's why "working with Clark" appeals strongly to a growing list of equipment manufacturers—automotive, agricultural, industrial.

Turn and see reverse side for more about CLARK products

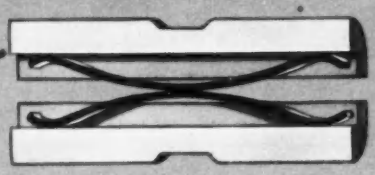
CLARK EQUIPMENT COMPANY, Buchanan, Michigan

Other Plants: BATTLE CREEK AND JACKSON, MICHIGAN

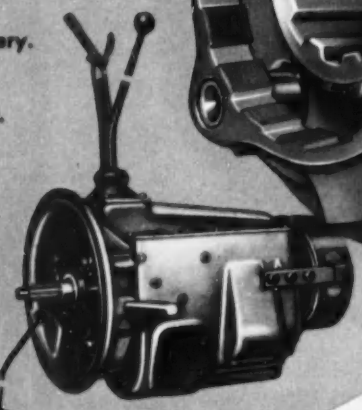
The NEW CLARK SPLIT-PIN SYNCHRONIZER

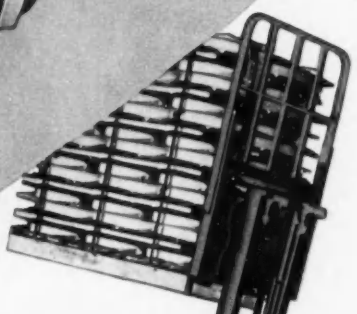
CLARK transmissions are now available featuring THE "SPLIT-PIN" SYNCHRONIZER. In keeping with its traditional enthusiasm for engineering development, Clark not only builds a full range of conventional models, but specializes in designing and producing transmissions for unusual requirements for trucks, busses, farm tractors, industrial trucks and road building machinery.

Write for Products Booklet.



1903 1953
CLARK EQUIPMENT





CLARK *POWRWORKERS*

POUND FOR POUND, dollar for dollar, you can't beat the value in CLARK'S POWRWORKER Line. They'll give you big-truck quality performance at rock-bottom, small-truck cost. If your warehouse, dock or terminal suffers from narrow aisles, low-load floors or low-clearance—then the rugged little POWRWORKERS are just what the Comptroller ordered to cut your handling costs. Write for Material Handling News.

Platform Truck

Pallet Truck

Tug Tractor

Stacker

CLARK EQUIPMENT COMPANY
BUCHANAN, MICHIGAN
Other Plants: Battle Creek and Jackson, Michigan

Products — **TRANSMISSIONS • AXLE HOUSINGS • GEARS and FORGINGS • TRACTOR UNITS • FORK TRUCKS and TOWING TRACTORS • FRONT and REAR AXLES for TRUCKS and BUSSES**

OBSERVATIONS

(*Continued from page* 98)

tion before the end of this year.

Linkage type power steering appears to have some interesting features. For one thing, the basic steering gear remains unchanged for all car production, thus simplifying procurement, stocking, and installation of steering gears on the final assembly line. The linkage package is simple and is readily installed at assembly. Still another important consideration is that on some makes there may be difficulty in accommodating the bulkier integral steering gear assembly in existing under-hood space.

We learned recently that one of the major suppliers is grooming air power steering for trucks and buses. The announcement may be out formally by the time this item appears.

Shell Molding

Some patent problems on deck at the moment are responsible for the lack of specific information on several mass production shell molding foundry setups currently in full operation in the automotive industries. It is noteworthy that the economy of shell molding encompasses an over-all picture including not only foundry operations but machining as well. For example, in the case of crankshafts, it may be feasible in the near future to eliminate most of the turning and probably start directly with rough-grinding. The crankshaft machining department of the future—using shell molding castings—can be more compact, will require considerably less machinery, and will be capable of unheard of productivity.

Automation Techniques

Since the unfolding of automation principles and the growing dependence of mass production on materials handling devices, it is of interest to find that this developing art has been covered in amazing detail in AUTOMOTIVE INDUSTRIES during the postwar years. We have already published a preliminary book giving a small sampling of what has been covered. There is enough material on the record to fill a much larger book and one may be readied in the near future if there is sufficient interest.

(*Turn to page* 104, *please*)

NON-METALLIC—SELF-LUBRICATING BEARINGS

YEP!
OSBEAR
THE LUBRIKON
HAS MOVED...

AND HIS COMPANY HAS CHANGED THEIR NAME, TOO!

HERE'S OSBEAR'S NEW ADDRESS!

NeverOil
SINCE 1913

O&S BEARING & MFG. CO.
777 W. EIGHT MILE ROAD • WHITMORE LAKE, MICH.

Brake Disks Deburred

(*Continued from page 53*)

hold the disks securely in place. This makes the assembly ready for insertion in a barrel, using an electric hoist.

When disks are loaded, the only surfaces not exposed to the abrasives that effect burr removal are three small arcs where spacers bear at each side of each disk. As extra fixtures are available, the operator who loads and unloads the barrels can unload and reload some of the fixtures while others are in use in the barrels.

After a rack filled with disks to be burred is lowered into a barrel, it is locked so that its axis comes in the axis of rotation. The operator then uses a hoist to elevate and dump into the barrel 500 lb of No. 5 granite chips. He then adds 10 lb of No. 10 Roto-Finish compound and one lb of No. 11 compound of the same make. Water is then added to a level six in. above the chips.

This completes the charge and the cover is applied and locked in place, after which a safety gate is put in place and a button is pressed to start the barrel turning at 20 rpm. It continues to turn at this speed for 45 min, but the direction of rotation is reversed automatically every five min during this period. As tumbling proceeds, the disks turn with the barrel but the abrasive mixture remains in constant motion over the disks and, in passing over sharp edges, removes the burrs thereon and rounds the edges slightly but uniformly, as desired. There is also a scouring action on other surfaces that tends to remove tool marks but the amount of metal removed on these surfaces is slight.

At the end of 45 min the barrel is stopped, the cover is removed and a hose is employed to flush compound out of the barrel. In general, the chips are not removed or only enough are dumped to facilitate unlocking and removal of the rack of parts, using the same hoist employed in loading. While the rack is suspended, its load is hosed off and then is removed and is replaced by another rack.

After the new rack is locked in the barrel, any chips removed at the end of the prior cycle are put back, new supplies of the spent compounds washed out are added, the water level is restored and the cycle is repeated. While it proceeds, the operator uses the hoist to dip the prior load, still in the fixture, into a tank containing a phosphate solution heated to 140-180 F. This dip tends to inhibit rusting and the heat helps to promote drying while the parts are being unracked.

With this setup, one unskilled man deburrs 120 disks per eight-hr day where before, using hand tools, a skilled operator deburred only 32 parts. After about 25 cycles, all chips are removed from each barrel and are screened to remove any that will pass a 3/16-in. mesh screen. Barrels are always dumped at the end of each shift and chips are hosed off before being put back in the barrels.

Roto-Finish compounds not only contain some fine abrasive but include components that keep the granite chips from becoming glazed, besides greatly accelerating the cutting action required for proper burr removal.

Specialized Production of
HARDENED & GROUND PARTS

When you've served the automotive industry for more than 40 years as we have done, you become quite adept at machining difficult pieces like the Beam Ball shown here.

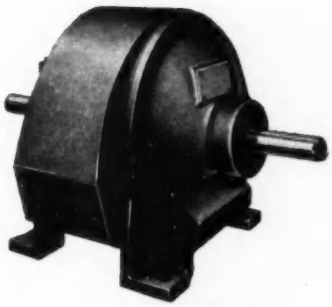
Ball O.D. is ground to 3.375" ±.001; Bore, to 1.375" ±.001. Circular contour is absolutely concentric with bore centerline. Scientifically controlled heat treating provides exceptional surface hardness and consistent strength throughout. The specified finish is Parco Lubrite, as used on many of our products.

This is a sample of the metallurgical engineering, precision grinding and uniform quality that can be readily applied to mass production of your turned, hardened and ground parts. Let us quote on your requirements. Write or wire today.

Henry W. Brown
PRESIDENT

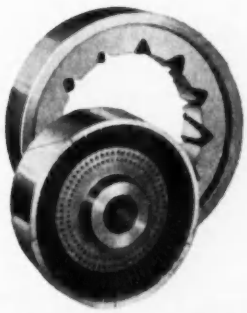
Experienced production on:
King Pins
Shackle Bolts
Shackle Pins
Brake Anchor Bolts
Countershafts
Idler Shafts
Stub Axle Shafts
Steering Ball Bolts
Beam Balls and Bolts
5th Wheel Rocker Shafts
Wheel Studs
Water Pump Shafts
. . . anything in the hardened and ground line; of any analysis steel, up to 4" . . .

THE BROWN CORP.
213 BELLEVUE AVE. SYRACUSE, N. Y.
C. H. Ehlert, 3407 Clarendon Rd., Cleveland • R. F. Spring, 4718 Balfour Rd., Detroit • R. C. Sanderson, 3029 N. Clark St., Chicago • Henry J. Windmiller, 1704 Carlton, Fort Worth • Johns Willem & Co., 1440 N. Spring St., Los Angeles, Calif. • John B. Hunt, 3611 S.E. Yamhill St., Portland, Ore.

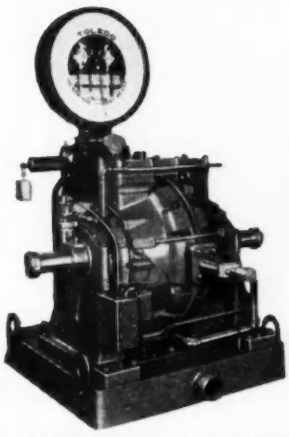


AIR COOLED COUPLINGS

AJUSTO-SPEDE MOTORS



AIR COOLED BRAKES



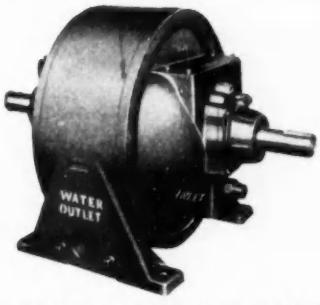
ABSORPTION DYNAMOMETERS

EATON

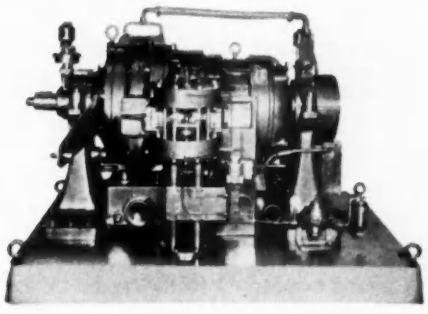
DYNAMATIC

EDDY-CURRENT ROTATING EQUIPMENT

PRESS DRIVES



LIQUID COOLED COUPLINGS



UNIVERSAL DYNAMOMETERS

LIQUID COOLED BRAKES

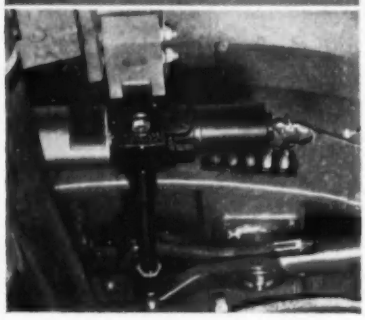
Dynamatic Eddy-Current electro-magnetic equipment represents the ideal solution for a wide range of adjustable-speed drive problems, particularly where an AC power source is a requirement. Typical applications include paper machine drives, cement mill drives, industrial truck clutches, press drives, crane brakes, fan drives—in fact, practically all test, processing, and conveying equipment common to industry. Instantaneous response and accurate control are important advantages.

Write for your copy of Bulletin GB-1 which describes and illustrates the basic Dynamatic units.

DYNAMATIC CORPORATION KENOSHA • WISCONSIN

Subsidiary of EATON MANUFACTURING COMPANY, Cleveland, Ohio

Rudder Trim System on Republic's F84F *Airborne actuated*



The R-244-M14 LINEATOR® Electric Linear Actuator is specified equipment on Republic's new sweptwing F84F Thunderstreak. This actuator features radio noise filter, neutral light switch, positive mechanical stops, and externally adjustable position limit switches.

For complete information about LINEATORs and other Airborne electromechanical actuators, see our literature in the Institute of the Aeronautical Sciences 1953 Engineering Catalog.

AIRBORNE
ACCESSORIES CORPORATION
1414 Chestnut Avenue • Hillside 5, N.J.

OBSERVATIONS

(*Continued from page* 101)

Engine Additives

In the April 1 issue of AUTOMOTIVE INDUSTRIES we commented on additives and suggested that reputable suppliers could profit by submitting controlled test data in proof of claims made for their products. Immediately thereafter our attention was drawn to a release by AP Parts Corp. on tests made with Miracle Power, an additive containing colloidal synthetic graphite. The tests were conducted by Wetmore Hodges and Associates, Redwood City, Calif., in its commercial test fleet, using two identical trucks, one with Miracle Power, the other without. Test results as submitted by this organization gave the following significant information: the vehicle using Miracle Power had 100 per cent longer fuel pump life, 56 per cent longer spark plug life, was using oil at a 33 per cent lower rate, had 13 per cent more compression, showed 15 per cent less piston ring wear, and 49 per cent less cylinder bore wear. These data are being presented here for study by interested people.

"PRODUCTION TOMORROW"

(*Continued from page* 64)

where there was any possibility of fine hair-like burrs to come loose under operating conditions we perform many operations to be sure to remove them. These vary with the part but the various methods are by filing or scraping by hand, wire brush, by stone tumbling and by corn cob and walnut shell blasting.

We also encountered a problem of leaks because of the pressures ranging from 27 lb to 200 lb used in this transmission. Castings obviously must be held free from porosity. New methods had to be developed with the foundries and design changes were necessary to minimize porosity.

Numerous tests were developed at different stages of operations of the parts to check for leaks. Some were pressure tests and some, such as on the oil pan, were vacuum tests. After the transmission is completely buttoned up we fill it with oil and apply a pressure test on the entire unit for leaks just before shipping.

Glass has a smooth, abrasion-resistant surface — won't scratch or pit. Glass never deteriorates. It retains its original strength and clarity under all kinds of weather and wear. Glass won't stain or corrode. Chemicals used on the highway don't damage it. And glass can't warp, shrink, burn or rust.

With all these advantages, Lancaster glass costs less — up to 50 percent less — than substitute materials.

Design flexibility? Glass is the ideal material where intricate shapes and exact tolerances are involved. Send the blue prints and complete details of the job you're working on now. Let us suggest how glass can solve your optics problems.

The *Lancaster Lens* Co.
LANCASTER, OHIO
industrial glass made to your specifications

- Stampings, not castings
- Welded for strength
- Easily adapted to most power units
- Air-cooled—Oil cooler can be added
- Leak-proof construction
- Low-cost manufacturing

Long Torque Converter for INDUSTRIAL and AUTOMOTIVE applications

New design and manufacturing methods permit us to combine top performance and low cost in Long torque converters. Already in high-volume production for passenger car use, they can be readily modified to many industrial applications. Eleven and 12-inch diameters cover a range of engines from 90 to 200 pounds-feet torque, depending upon nature of service. With torque ratios at stall of 2.1 to 1 and efficiencies over 90%, they should simplify many power transmission problems. We are prepared to extend the engineering cooperation required to insure a satisfactory installation. Your inquiries are invited.

LONG MANUFACTURING DIVISION • BORG-WARNER CORP. • DETROIT, MICH. AND WINDSOR, ONT.

50 Years of Quality Manufacturing for the Automotive Industry

LONG

A PRODUCT OF BW BORG-WARNER

TORQUE CONVERTERS • CLUTCHES • RADIATORS • OIL COOLERS

The Ideal Automatic Transmission

(*Continued from page* 67)

The engine curve that has been selected as optimum can be obtained only with an infinitely variable torque ratio type of transmission such as a fluid torque converter. Gear type transmissions must rise well above the optimum engine speed so that their average performance in each gear is acceptable.

The stall ratio of 4.0 selected is not obtainable by any of today's torque converters. All must have a geared ratio in addition which calls for a friction clutch shift and change of engine speed.

Therefore all of today's transmissions, were they shooting at this mark, must have compromised it.

Reverting back to Fig. 2, the performance of the Idealomatic with the average passenger car is shown.

As originally outlined the drawbar load, or maximum force at the rear wheels, of the 100 per cent efficiency transmission operating at 3700 engine rpm is shown as the upper curve.

The mid curve on the sheet shows the drawbar force that is available due to engine speed reduction below the horsepower peak. The difference between these two curves may be called the horsepower sacrificed for pleasability.

The lower curve represents the Idealomatic performance with both the losses for reduced engine speed and efficiency included.

Passing ability in the 60-90 mph range has suffered very little as a result of the Idealomatic's engine speed and efficiency. This is a direct result of the small variation in horsepower input by the engine in the 3200-4050 range and the high speed efficiency.

With the performance curve shown, the Idealomatic would not provide overall acceleration ability much greater than some of our geared type of transmissions today, but it would provide it smoothly and pleasingly.

The maximum full throttle performance of the Idealomatic must be available at full accelerator position and at any car speed if the transmission is to be 100 per cent automatic. The ability of the transmission to provide maximum tractive effort and the ability to provide this tractive effort automatically are two separate and distinct functions in present transmissions.

In many cases, particularly where a geared ratio, or a selection of geared ratios is provided behind a converter, a manual shift must be made to get maximum tractive effort at the lower car speeds.

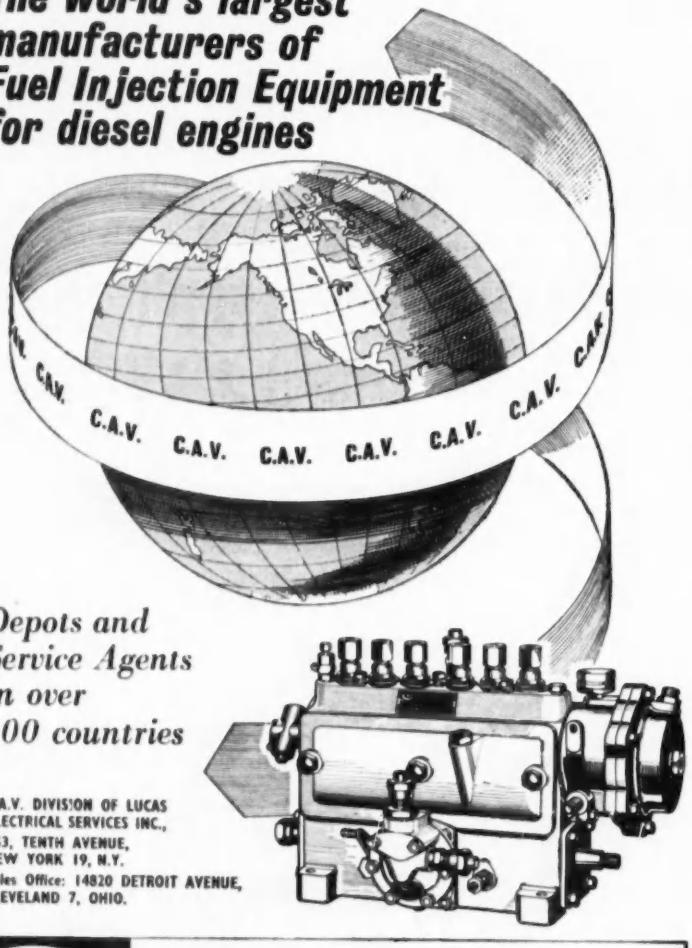
Even some of our most fully automatic geared ratio transmissions suffer a deficiency in this respect. Although maximum tractive effort is available when the car is accelerated from a standing start, it is not available after the transmission has once upshifted and car speed maintained. At some car speeds automatic downshifts are made into 3rd gear ratio when 2nd gear would provide better performance, or into 2nd gear when first gear's performance is more suitable.

A summary of the performance limitations of present transmissions follows:

1. Present converters supply an infinitely variable ratio that covers only a part of the performance range. As a result one or two

C.A.V.

The world's largest manufacturers of Fuel Injection Equipment for diesel engines



Depots and Service Agents in over 100 countries

C.A.V. DIVISION OF LUCAS ELECTRICAL SERVICES INC., 653, TENTH AVENUE, NEW YORK 19, N.Y.
Sales Office: 14820 DETROIT AVENUE, CLEVELAND 7, OHIO.

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174-606

As Time Goes By . . .

. . . "DETROIT" Sets the Pace for Universal Joints

America's leading cars—thoroughbreds of the road—have come a long way since the first "one-lunger". During this progress, the continual step-up of engine power has increased tremendously the burdens placed on universal joints. Improvements in "DETROIT" Universal Joints have kept pace with car and truck design to help America's vehicle manufacturers achieve products of vision and initiative.

DETROIT
UNIVERSAL JOINTS

UNIVERSAL PRODUCTS COMPANY, Inc., Dearborn, Michigan

...ARE PROVIDING SNAP-ACTION-POWER IN REMOTE CONTROLLED APPLICATIONS!

Manufacturers of appliances, radios, business machines, instruments, industrial equipment, automotive equipment, and aircraft have used over a million *LEDEX* Rotary Solenoids to provide dependable snap-action-power in their products. New applications are being developed every day, using *LEDEX* Rotary Solenoids as the source for torque.

Most basic sizes can be obtained with left hand or right hand rotary strokes of 25°, 35°, 45°, 67½°, or 95°.

typical torque values are shown in the table

Model Number	2	3	5	6	7	8
Diameter	1⅛"	1⅛"	1⅛"	2¼"	2¼"	3⅜"
Torque lb.-in.*	⅛	1	5	10	25	50
Weight lbs.	⅛	¼	½	1	2½	4¼

*45° stroke intermittent duty.

You are invited to explore the possibility of using *LEDEX* Rotary Solenoids to improve, simplify and cut costs in your products.

WRITE TODAY FOR LEDEX ENGINEERING DATA!

LEDEX ROTARY SOLENOIDS

J. H. Leland INC.

123 WEBSTER STREET, DAYTON 2, OHIO

mechanically geared ratios are required in addition to the converter.

2. No transmission of any type provides 100 per cent automaticity of performance in the full throttle range when called upon to supply maximum tractive effort.
3. In most cases fully automatic performance could be available. To make it more available in present designs would compromise other factors that are equally important.

Economy and Part Throttle Performance Characteristics

The Idealomatic would cause the engine to operate in its most economical speed range under normal road load and light throttle acceleration conditions. This implies overdrive due to the friction horsepower characteristics of the engine and present limitations on lower axle ratios. Transmission efficiency must be a maximum in this range such as is provided by a lock-up clutch or partially mechanical drive.

It is believed that particular emphasis should be placed upon a *range* of accelerator pedal travel in which the transmission stays in economy ratio. Converters are relatively efficient fluid couplings when driven at light throttles and constant speed. With light and medium throttle acceleration requirements such as are encountered in normal city driving their inherent nature is to increase engine speed and decrease their own efficiency, a double loss of economy.

A range of torque multiplication must be provided between the part throttle economy drive and the full throttle performance if the Idealomatic is to provide satisfactory overall performance. There is a definite requirement for an infinitely variable torque multiplication, for passing and grade climbing at part throttle conditions. This requirement is well met by present converters and only partially met by an automatic gear range selection.

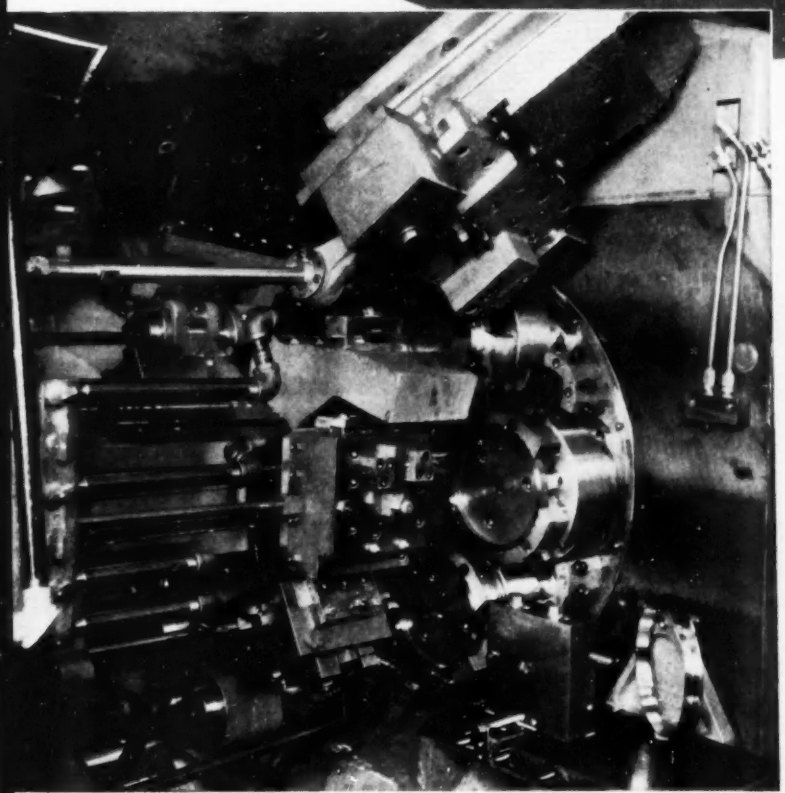
Smoothness and Response

For absolute pleasability the Idealomatic would be completely smooth in its transition from economy through mid range to full performance ratio. This requirement is probably the toughest to obtain practically if all of the Idealomatic's other features are to be retained.

The ideal of absolute smoothness exists in the fluid torque converter type of transmission and it is the objective of every friction clutch en-

(*Turn to page* 112, *please*)

ACME-GRIDLEY CHUCKERS take the TOUGH JOBS



This 8" Combustion Chamber Flange for jet engines is no job to be fooled with.

Machined from 8" diameter stainless steel blanks as shown, it presented first the problem of removing a lot of metal FAST—321 stainless is a difficult metal for precision results.

Tooling for accuracy and finish included both roughing and finish taper turning and boring attachments for the special angles and for holding the thin wall within .008 without danger of collapsing the piece.

All 13 operations were performed on the 10" Acme-Gridley Model RPA 6-spindle fully automatic Chucking Machine with carbide tipped tools at a net output rate *more than 6 times faster* than was possible on the turret lathe method formerly used.

Performances like this have demonstrated to the owners of more than 45,000 Acme-Gridley bar and chucking automatics that design rigidity and tooling ingenuity are your best insurance for sound production and profitable end results.

Acme-Gridley Chucking Automatics are built in 4, 6 and 8-spindle models with capacities ranging from 5¼ to 12".

★ **Ask for guaranteed figures on your work—Tough jobs or otherwise.**

JOB FACTS:

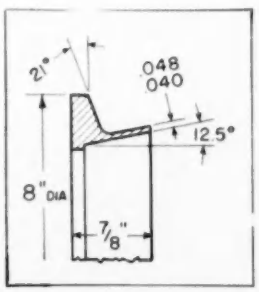
PART—Jet Combustion Chamber

SIZE—8" Diam., ⅞" long

MATERIAL—Type 321 Stainless Steel

OPERATIONS—13, all with Carbide Tools

MACHINE TIME—1 minute, 16 seconds



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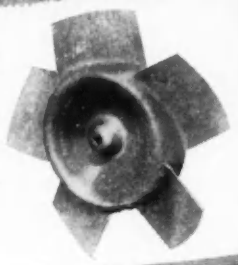
with precision die molded airfoil section blades moves maximum air with least noise and power consumption. Sturdy one-piece construction; nothing to loosen or get out of balance.



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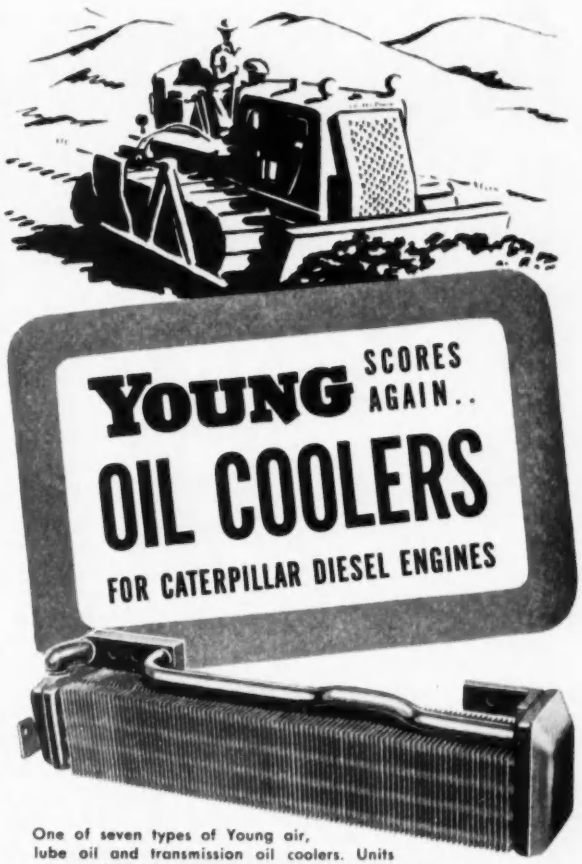
FOR EVERY TRUCK AND BUS

ANNUAL REPORTS—AT A GLANCE

	Sales (millions)		Net (millions)	
CARS, TRUCKS, ENGINES	1952	1951	1952	1951
ACF-Brill	21.2	23.6	1.8	2.5
Caterpillar	477.5	393.7	22.1	15.7
Chrysler	2600.9	2546.6	78.6	71.9
Clark	131.8	130.1	5.5	5.2
Continental Aviation	9.2	6.0	.26	.12
Continental Motors	264.2	166.6	6.1	4.4
Fairbanks-Morse	117.8	116.0	4.6	4.9
General Motors	754.9	746.6	55.9	50.6
Hudson	214.8	186.0	8.3	—1.1
Intl Harvester	1204	1277.3	55.6	63.0
K-F—automobile	98.0		—8.7	
—defense	114.9		3.0	
Nash	358.4	401.1	12.6	16.2
Packard	233.7	178.1	5.6	5.5
Reo	156.4	112.8	3.2	2.4
Seagrave	5.1	3.7	.31	.13
Studebaker	586.1	504.0	14.2	12.6
Twin-Coach	42.1	39.4	.89	1.10
White	148.5		3.4	4.3
Willys	301.6	219.8	6.0	4.5
Wisconsin	37.7	32.4	1.35	
PARTS, TOOLS				
Am Brake Shoe	135.3	147.5	4.6	6.4
Am Mach & Foundry	105.8	54.2	4.1	2.7
Auto-Lite	271.1	292.7	9.7	11.1
Avco	326.5	286.5	11.0	10.0
Bendix Aviation	508.7	304.5	15.2	11.8
Borg-Warner	353.9	369.1	22.9	21.2
Carborundum	70.1	78.5	4.7	6.4
Clearing	20.4	15.3	1.5	1.2
Clevite	54.1	50.0	3.4	2.8
Ex-Cell-O	88.9	60.2	5.7	4.4
Gabriel	17.8	15.7	.014	.59
Houdaille-Hershey	64.6	70.4	2.1	2.4
Link-Belt	126.5	118.4	8.0	8.1
L-O-F	166.4	176.1	14.9	15.4
Monarch Machine	26.1	16.4	1.4	.74
Motor Wheel	68.8	74.4	2.5	2.9
Nat Auto Fibres	73.5	86.7	2.0	3.2
Reliance Electric	8.7	9.1	.38	.44
Revere C & B	187.7	180.8	6.7	6.9
Stewart-Warner	122.5	103.2	4.2	4.1
Sunstrand	36.5	24.2	2.0	1.1
3M	185.2	170.0	16.0	15.7
Timken-Detroit	233.3	138.0	6.8	5.5
Titeflex	14.0		1.2	
Warner & Swasey	55.1	32.9	3.6	1.9
Westinghouse	1454.2	1240.8	68.5	64.5
AIRCRAFT				
Boeing	739.0	337.3	14.0	7.1
Convair	390.9	322.1	10.4	7.7
Fairchild	142.0	75.2	3.1	2.2
Lockheed	438.1	237.2	9.0	5.7
Martin	143.9	68.4	5.8	—22.1
Pac Airmotive	27.6	23.9	.42	.74
Republic	412.2	130.4	6.0	2.9
Ryan	34.9	22.2	.87	.40
Temco	55.1	37.2	1.8	1.1
United Aircraft	667.7	417.2	17.8	14.2
Metals				
Int Nickel, Canada	314.2	286.7	58.8	62.8
J & L Steel	495.4	564.3	19.4	30.9
U S Steel	3137.3	3524.1	143.6	184.3
Vanadium Corp.	38.3	35.8	2.3	2.0



One of seven types of Young air, lube oil and transmission oil coolers. Units are available for Diesel engines, motor graders, etc.

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* Young Oil Coolers have excellent tube and fin contact because tubes are round, seamless and expanded into fins under pressure. Result is a mechanical bond which does not separate.

* Young Oil Coolers feature a patented header plate with a well formed around each tube which confines the brazing material around the periphery of the tube. This permits equal distribution of strains around the entire tube.

* Young Oil Cooler tanks are silver brazed to the header plates. Silver brazing provides a uniform seal and a neater and smoother job than electrical welding.

* Young high capacity is attained by the use of the Young-patented turbulator. It prevents collection of congealed oil film on tube walls; makes unit self-cleaning, and eliminates carbon deposits and other foreign impurities.

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1. PRESSURE STORAGE CHAMBER to provide
   a. Main source of hydraulic power.
   b. Auxiliary power source.
   c. Emergency power source.
2. PRESSURE-VOLUME COMPENSATOR for
   a. Leakage compensation.
   b. Temperature compensation.
3. DISPENSER OF FLUIDS and Lubricants.
4. TRANSFER BARRIER for Fluids and Gases.
5. SHOCK ABSORBER to
   a. Absorb line shocks.
   b. Reduce pump pulsations.

Hydraulic components seldom get such an exhaustive workout during manufacture as Greer Accumulators. At every step on the production line the accumulator parts are checked, double-checked, and signed for by an inspector before the next operator will touch them. Finally the accumulator is cycled as a unit under simulated operating conditions. The inspector who puts his final OK on the tag will bet his life that the accumulator will function properly.

If you want to know how Greer Accumulators can reduce the size, cost, and complexity of your equipment, write or phone.

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(*Continued from page* 108)

thusiast to produce automatic shifts that would equal its smoothness and response.

Specifically the advantages that the converter holds over the geared ratio transmission in this respect are its ability to change ratio without a cessation of drive line torque and its direct and immediate response to a change of engine torque. Friction clutch shifts require that drive line torque be broken to change ratio and response must be provided by an outside control that attempts to sense engine torque change.

As has been previously mentioned the converter alone has a limited performance range and inability to provide the most economical operation. This gives rise to the requirement for friction clutch shifts through geared ratios and into lock-up clutches. The problems inherent with producing a simple, low cost control, free of manufacturing variations that will produce an absolutely smooth shift are numerous and, to date, unsolved. As a result, some manufacturers have compromised other factors a great deal to provide the converter's smoothness in the normal driving range.

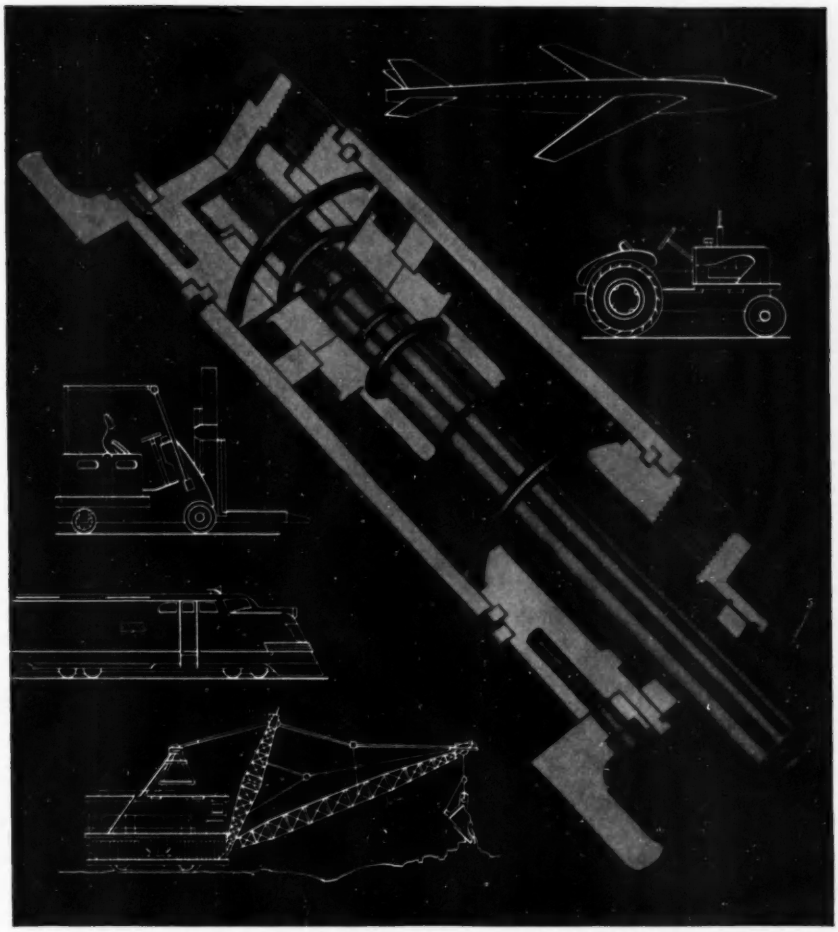
Cost of the Transmission

Cost is the fourth major item that requires compromise in today's passenger car transmissions. The Idealomatic would, of course, perform all of the functions previously mentioned as well as the miscellaneous features that follow, so simply and cheaply that it would be priced along with present competitive transmissions.

Overrun Braking

The requirement that the transmission provide braking ability for coasting down grade has caused additional compromising in automatic transmission design. It is apparent that one gear ratio will not provide the most pleasing braking ability for all car speeds and grades. A recently announced innovation in automatic transmissions provides three overrun braking ranges manually selectable by the driver. Our Idealomatic, therefore, must have at least this many and to be truly ideal would provide an infinitely variable overrun ratio sensitive to both grade and car speed.

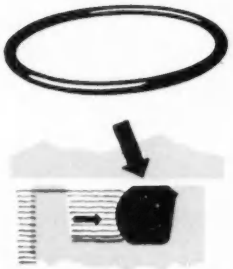
Converters are useless with respect to providing engine friction braking without the addition of mechanically geared ratios. Due to the free wheelers required in their torque multiplying members the converter furnishes nothing but an inefficient fluid coup-



Cutaway view of an Ortman Miller Machine Co. Standard Hydraulic Cylinder showing PARKER O-rings.

Specify PARKER O-rings for economical, leakproof seals

THIS IS IT



Cross section drawing of O-ring in groove, sealing under pressure.

For sealing in a hydraulic cylinder . . . or for whatever service you need them, you can get PARKER O-rings, molded of expertly formulated synthetic rubber compounds, that will provide long, trouble-free sealing life. That means they are economical to use. They're economical, too, because they require no complicated design . . . just a simple groove, usually saving space and weight.

PARKER makes *all* standard O-rings for fuel, hydraulic and engine oil services as well as special-service O-rings. Ask your PARKER O-ring Distributor for Catalog 5100, or write The PARKER Appliance Co., 17325 Euclid Ave., Cleveland 12, O.

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CANADA
Railway & Power Engineering Corp., Ltd.

ling drive in coast. Introduction of a gearset for braking only in a converter design is a costly compromise.

Geared ratio transmissions, on the other hand, cheaply provide the same gear ratio and clutched drive used in forward gear for braking application.

Manual Shifts Characteristics

The manual shifts into Drive, Lo, Reverse and Parking would be fast and smooth regardless of throttle position and car speed. This is a large requirement for a short sentence but space limits discussion of these features. In general, however, the characteristics of these shifts are not as dependent on the fundamental design as previous features mentioned.

Noise Level

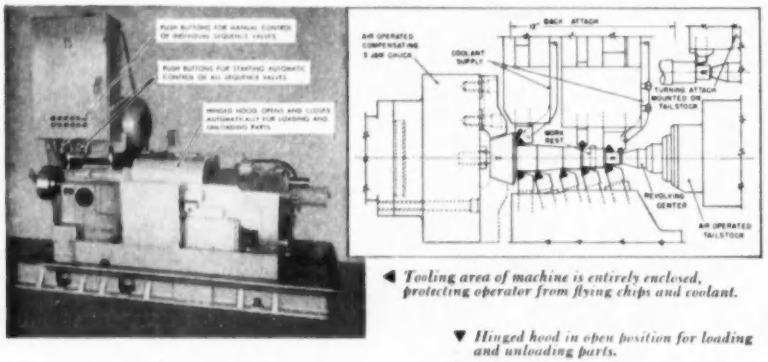
The Idealomatic would be noiseless in operation. Freedom from converter cavitation, whine, gear noise, hydraulic pump noise, etc., would be essential.

It should be apparent from the foregoing that the future Idealomatic will require considerable development of, and probably deviation from, the fundamental designs of today when it is produced.

The preceding article is from the prize-winning paper in the Henry Ford Memorial Award Competition sponsored by the Junior Section of SAE in Detroit.

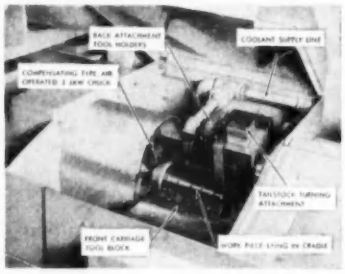
MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK



◀ *Tooling area of machine is entirely enclosed, protecting operator from flying chips and coolant.*

▼ *Hinged hood in open position for loading and unloading parts.*


BACK ATTACHMENT TOOL HOLDERS
COOLANT SUPPLY LINE
COMPENSATING TYPE AIR OPERATED 3 JAW CHUCK
TAILSTOCK TURNING ATTACHMENT
FRONT CARRIAGE TOOL BLOCK
WORK PIECE LYING IN CRADLE

Lo-swing LATHE EQUIPPED WITH AUTOMATIC CONTROLS REDUCES HANDLING TIME...

Problem: To reduce handling time and operator fatigue in machining operations on Axle Pinions.

Solution: A Model AR Automatic Lo-swing Lathe, tooled as illustrated, was selected for this job. Work is held on centers and driven with an air-operated, three-jaw compensating chuck. Five carbide front turning tools, two of which are template operated, reduce the length of cut to 1-7/8", which is the length of the taper portion. An additional tool, mounted in a tailstock turning attachment, partially removes surplus material on the threaded diameter in advance of the front turning tool which finish turns this diameter. Six carbide tools on the rear slide face and chamfer the shoulders.

The machine stops automatically at the end of the cycle with spindle stopped, chuck jaws released, tailstock center retracted, hinged hood open and with the machined part dropped into a cradle. The operator simply replaces the finished part with a rough forging and then pushes the two starting buttons, energizing the loader controls, which consecutively close the hood, places the work between centers, closes the chuck jaws and finally starts the headstock spindle rotation. The automatic cycle from then on is controlled by automatic camming built into the base machine.

The tooling area of the machine is entirely enclosed to protect the operator from flying chips and coolant, while cutting at high spindle speeds. Two starting buttons, wired in series, oblige the operator to use both hands, and are so located that the operator is out of range of the closing hood, thereby preventing accidents.

Control buttons on the door of the starter panel permit normal operation of individual controls and are convenient for setting up and timing loader movements.

Seneca Falls engineering staff is at your disposal to help solve your engineering problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing

Tooling J-47 Turbojet Engine

(*Continued from page 72*)

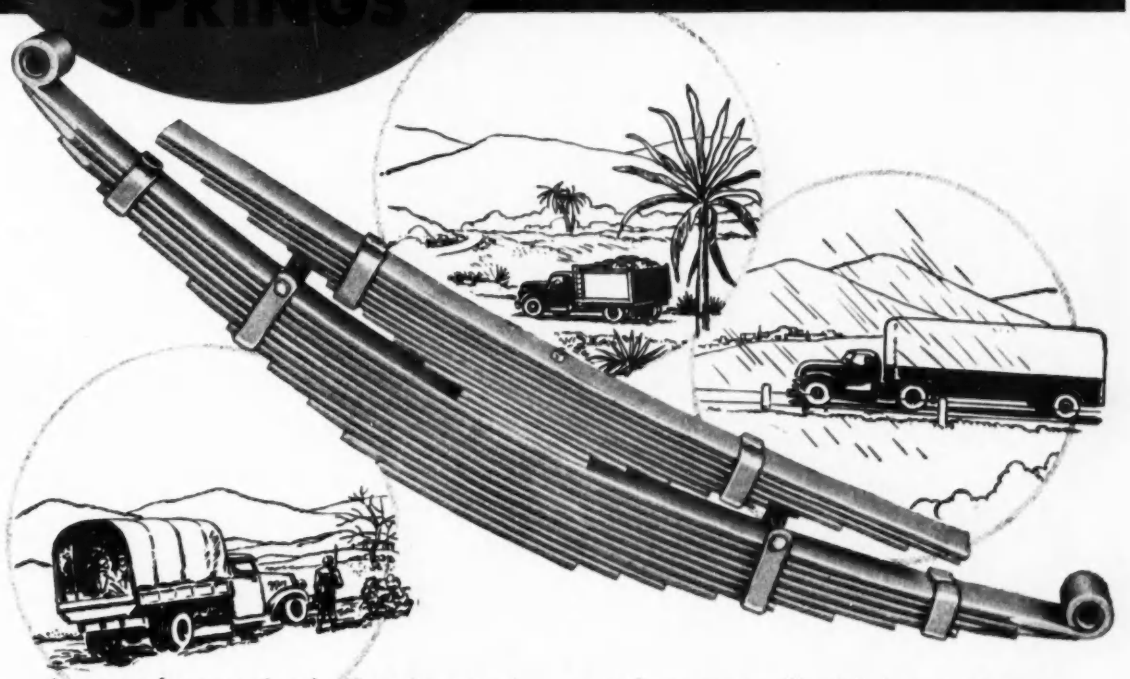
Internal and external splines on the two wheels are machined on Fellows gear shapers. In this respect, an item of interest is that one of these shapers, made for external shaping, has been redesigned with a special fixture for machining internal splines on number 12 rotor. Broaching and curvic coupling grinding operations similar to those completed on wheels 2 through 11 are then carried out. The steel wheels are hand ground for static balance.

When the entire compressor rotor section has been completely assembled, by engaging the teeth of the curvic coupling and securing with the 12 bolts, it is placed in a Gisholt Dynetric balancer for obtaining proper dynamic balance. Permitted tolerances for the balancing job are on the order of 1.5 gm in. for the forward section and 2.0 gm in. for the aft section. A high speed pit is also utilized to aid in the checking and testing of this section.

In addition to the equipment mentioned above, the following machines also are used in the Parts Manufacturing Building. One of these is a Heald Boremetic that is used for line boring the cover and compressor front frame of the engine. This requires extremely close tolerances and is performed in a special temperature controlled room. Another unique machine is of Swiss manufacture—a Reishauer. This machine, which is used to automatically grind accessory gears to very close tolerances, is equipped with an automatic wheel dressing setup. There are two Hartford Special drilling machines for operations on the rear frame and turbine wheel. The unit used on the rear frame drills, reams, countersinks and taps 48 holes in the OD, using nine heads. For operations on the turbine wheel, four heads are used and these drill, ream and countersink 96 holes.

DSP Leaf SPRINGS

ON TRUCKS—THE WORLD OVER—THE TOUGHEST JOBS PROVE THESE SPRINGS CAN "TAKE IT"



Army trucks operating in Korea's rugged terrain. Construction trucks on the Pan-American Highway. Trailers hauling enormous payloads from coast to coast in our own country.

On much of this equipment, springs, engineered to stand the punishment of the most demanding conditions, are supplied by DSP. Makers of America's heavy trucks use DSP Leaf Springs as original equipment in some, or all, of their current production; for both civilian and military use.

DSP's Automotive Division *SPECIALIZES* in this most important product . . . with its engineering, research, and production facilities directed toward one objective—the design and production of better leaf springs.

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Withstands 500° F. in Color Application

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SICON SILICONE FINISH — CONVENTIONAL FINISH

These two heater shells were subjected by Midland Engineers to a 500° F. heat test, for four hours, followed by a 300 hour salt spray test conforming to ASTM B117-49T. SICON retained color, gloss, adhesion. A widely used specification finish for this purpose failed completely. The pictures tell the story.

ACTUAL TESTS PROVE SICON'S SUPERIORITY

It was felt that army ordnance requirements for truck heaters demanded an olive drab protective finish that would withstand temperatures of approximately 500° F., followed by a salt spray test. SICON was tried and is being used by Stewart-Warner in production because it met these rigorous demands.

If you require a finish in a *decorative color* with specific heat resistant properties, SICON, the original Silicone-Base Heat Resistant Finish, may be the *only* finish that will do the job. It will pay you to investigate. Write for illustrated brochure without obligation.

Manufactured by

MIDLAND INDUSTRIAL FINISHES CO.

WAUKEGAN, ILLINOIS

ENAMEL • SYNTHETICS • LACQUERS • VARNISHES

New Reo Gold Comet Engine

(*Continued from page* 65)

details obvious upon closer inspection.

Among the features contributing to greater output are a change in carburetor mounting as well as a change in carburetor design. Whereas on the OA the carburetor is mounted on a ledge over the exhaust manifold on an adapter that feeds mixture into the side of the intake manifold—on the OH engine the carburetor is mounted directly on the top face of the intake manifold, feeding in full down-draft fashion. A new type twin-barrel carburetor for this engine is being supplied by Zenith and Holley. In the case of the latter, Reo also uses the Holley sandwich type governor for speed control.

Compression ratio has been increased to 6.73 to 1, the OA employing 6.4 to 1. However, both operate on regular service station gasolines.

The new engine has a new high-lift camshaft with different timing, actual valve overlap being 35 deg. Although electrical equipment remains basically the same, the OH has a different ignition distributor with a different curve for automatic advance.

Since the OH engine has greater output, by some 12 per cent, and since it is intended for much heavier duty, all power producing elements have been changed to effect still greater rigidity and greater load carrying ability. This is the feature that prevents interchangeability of major parts between the OA and OH models, despite their outward similarity.

First is a new and heavier crankshaft. Main bearing and journal diameters have been made larger, with a consequent increase in bearing liner sizes. In addition, the crankshaft is fully counterweighted with a counterweight at each cheek. The torsional vibration damper is a Schwitzer-Cummins rubber type.

This change in bearing diameters results in a chain reaction. For one thing, it requires a different cylinder block casting since the main bearings are larger. In addition, the bulkheads on the interior have been given additional stiffness to permit greater load-carrying capacity without vibration.

This change also affected connecting rods. On the OH, the rods have a larger big end, and are made stronger and stiffer.

Although the ring setup and bore are the same, the pistons are differ-

This die is different
because it is made of aluminum (Alcoa Aluminum Tool & Jig Plate). It is easier to handle, faster to machine and costs less to make than a steel one.
Alcoa Tool & Jig Plate is also used to make fixtures, low-pressure rubber and plastic molding dies and dies for forming aluminum sheet.
Alcoa casts Tool & Jig Plate in thicknesses from ¼" to 4". It is normalized and available from stock in widths up to 48" x 96", machined both sides.
Aluminum Company of America, 1951-E
Alcoa Building, Pittsburgh 19, Pa.
ALCOA ALUMINUM TOOL & JIG PLATE
Alcoa Aluminum
ALUMINUM COMPANY OF AMERICA

ON LAND, SEA AND AIR

LORD Flexible Couplings

TRANSMIT THE FULL POWER OF BOEING TURBINE ENGINES

HERE again you see at a glance Lord versatility in designing bonded-rubber components for a wide diversity of machines. The photo at top right shows the Boeing Gas Turbine-Driven Truck-Trailer for heavy cargo hauling. At the top left you see a United States Navy personnel boat driven by the Boeing Gas Turbine Engine. Directly beneath is the Kaman Helicopter powered by the Boeing Gas Turbine Engine; details are clear in the foreground. The Lord Bonded-Rubber Flexible Coupling designed for the job transmits the power in each machine.

Special requirements like these reach satisfactory and economical solutions at Lord, Headquarters for Vibration Control. We invite you to take advantage of more than a quarter century of design experience and craftsmanship.

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LORD BONDED RUBBER

Headquarters for VIBRATION CONTROL

ent. The OH engine is fitted with the new Zollner Clear-O-Matic, heavy duty aluminum alloy pistons with a special steel ring cast into the structure to control clearance with the cylinder bore. Clearance control is said to be so precise that at assembly clearance is held to only 0.001-0.0018 in. near the bottom of the skirt. The concave dome as well as the top ring lands are anodized, while the skirt, including the area just above the piston pin, is tin-plated.

The pressure feed lubrication system is similar to that of the OA design. However, the Eaton rotor oil pump is larger, and has a capacity nominally of 12 gpm. An important feature of the pump is an integral by-pass. Another change is the provision of a deeper oil pan, designed to lower the oil level in the pan and thus prevent "dipping" when operating on severe grades.

An oil cooler will be installed as standard equipment of all OH-160 models. The basic design of the OA engine includes provisions for integral mounting of an oil cooler when specified.

In summarizing the comparative features of the OA and OH engines, it may be noted that in the main only the following elements are similar: wet sleeves; valves and timing gears; water pump; and electrical accessories.

Torque and bhp curves for the OH engine, reproduced here, are said to represent conservative ratings, using the 1952 SAE gasoline engine test code procedure and correction factors.

BOOKS...

THE ORGANIZATIONAL REVOLUTION, *by Kenneth E. Boulding, published by Harper & Brothers, 49 East 33rd St., New York, N. Y. Price, $3.50.* This book is the second in the Series on the Ethics and Economics of Society being published in cooperation with a study committee of the National Council of the Churches. Here a noted economist analyzes the continuously increasing importance of large organizations — business, labor, farmer, veteran, fraternal, and similar groups—in American economic life, and the problems of ethical conduct created by the human relationships in such organizations. The tensions between the immediate purposes of these organizations and the claims of individual personality are considered. One full section of the book is devoted to case studies illustrating the impact of big-scale organization upon the standards by which we judge economic policy and behavior. The book concludes with an extended critique by Reinhold Niebuhr.

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the only battery separator with all these advantages!

Uniform high quality—every Evanite separator is identical whether you compare two or two million.

Evanite is an improvement over nature! Wood has long been recognized as the most satisfactory low cost separator material. Now the new Evanite *interwoven wood fibre* separator utilizes wood in improved form. Evanite separators, tested in 20,000 batteries in daily use up to three years, have delivered more than their guaranteed battery life without a single separator failure.

Write today for full details on Evanite—Made *only* by Evans Products Company, Western Division, Dept. P-5, Plymouth, Michigan. Mills at Coos Bay, Ore.; Roseburg, Ore.; Vancouver, B. C.

Ask your battery manufacturer for complete product and case history information on the advantages of Evanite.

Compare These Advantages of Evanite Separators

TESTED IN 20,000 VEHICLES for periods up to 3 years under actual operating conditions.

OUTSTANDING PERFORMANCE, equalling or surpassing conventional separators.

NO SPLITS, NO CRACKS—Completely uniform. No candling required.

NO TREATING, NO WET HANDLING—Treated at the factory and shipped *dry*.

CUTS SHIPPING COSTS—Much lighter than ordinary separators.

ECONOMICAL—Cost no more than ordinary treated wood separators.

BACKED BY EXPERIENCE—Produced by Evans, whose years of experience are your assurance of finest quality.

EVANS — ***WORLD'S LARGEST MANUFACTURER OF BATTERY SEPARATORS***

Indianapolis Preview

(*Continued from page* 52)

is used by most cars at the track. The use of the transfer gear arrangement on the back of the transmission reduces unsprung weight on the rear end by about 35 lb. It also allows a lower overall car height by permitting the driver to sit alongside the driveshaft. The direction in which the driveshaft normally turns is reversed with this arrangement.

The two Novi cars, powerful threats but unlucky contenders for years, are once more ready to go. Duke Nalon and Chet Miller will again drive them. Jean Marcenac, chief mechanic, feels he has the breakdown jinx licked with a correction of last year's trouble. The supercharger driveshafts which broke on both cars were strengthened this year, by modifying the design, and by use of different material and heat treatment.

The Ferraris, much heralded invaders of last year's race, will be represented by a Howard Keck entry, the only one entered up to press time. The Ferrari management, it is understood, needs more time to modify its own cars. Work on engine changes is reported, with the Italians said to be attempting to raise the output another 50 or 60 hp. In all probability they will turn up in 1954.

Rear drive cars again predominate. Except for the Novis, and possibly a few other entrants, all will be rear drives. Each year, as the speeds increase on the turns, the front drive design seems to encounter greater front tire wear problems.

A majority of cars will be equipped with the Hilborn fuel injection system. This system was described fully in AUTOMOTIVE INDUSTRIES, May 1, 1949. It has become increasingly popular because of the simplicity of design and minimum necessity for adjustment.

Excluding the Novis, there are few supercharged entries.

New, longer-wearing Firestone tires will appear on all cars this year with the possible exception of one or two foreign entries. Designed primarily for improved lasting qualities, the new tires, according to driver George Connor, can be expected to give about 1½ mph increased speed. The tire was given a long series of tests at the Indianapolis track from July through December with Connor doing all the test driving and using four different Indianapolis racers. Tests were run at an average speed of 135 mph.

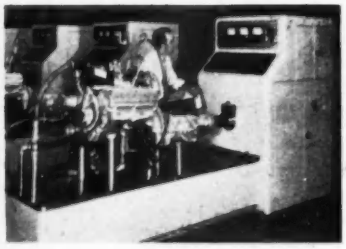
The new tire with its ⅝ in. wider area of road contact provides more traction area. The overall area of contact is about 18 sq in., depending on the weight of the car.

The rear rim is 7 in. wide compared with the 5.5 in. rim used previously. The front rim will be either 5.5 in. or 6.0 in. instead of the former 4.5 in. rim. Inflation pressures will remain the same, approximately 40 lb. Pure nitrogen for tire inflation will again be used.

A large group of car owners are instituting this year a movement aimed at prohibiting the use of nitromethane at the track. Used as a fuel additive, the chemical produces increased horsepower. But the owner's group feels it is still too early to allow its regular use, as a lack of experience with it has resulted in damage to engines.

Rough road testing machine

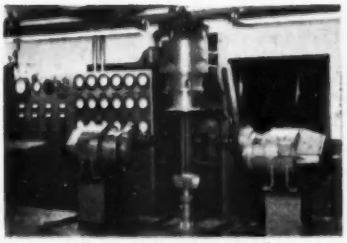
Engine dynamometer (absorption)



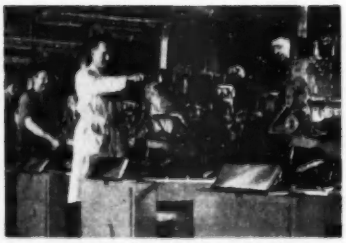
The "No-Mile" Inspectors

Engine dynamometer (hydraulic)

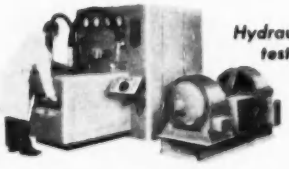
Test after test after test! New cars are subject to a never-ending series of them. Pictured here are just a few Nankervis testing devices in everyday operation—some standard, some special! You, too, can find help at Nankervis. Write today!



Transmission test stand



No-load engine test stand



Hydraulic pump test stand

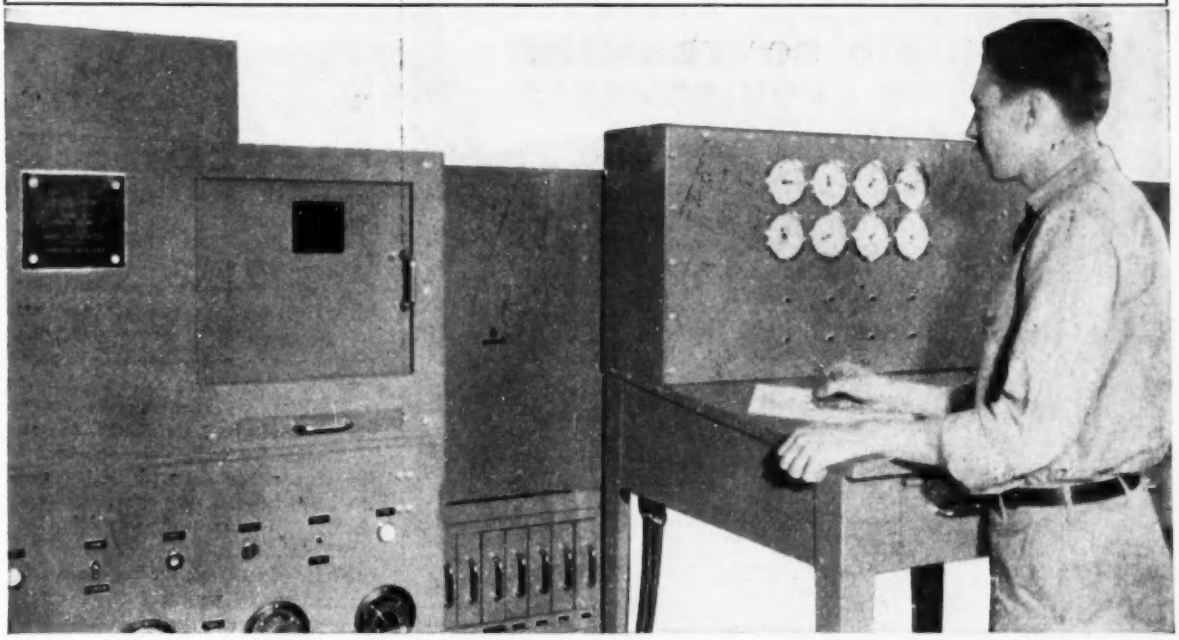
Automotive accessories test stand

GEORGE L. NANKERVIS COMPANY

INDUSTRIAL TESTING DEVICES

19255 W. Davison Avenue Detroit 23, Michigan

Rigidly controlled chemistry



Another reason why you get uniform, high-quality forgings with TIMKEN® forging steels!

YOU can be sure of uniform forgings when you use Timken® forging steels. That's because the quality of Timken forging steels is rigidly controlled, from melt shop all the way through final inspection, by the most precise methods known.

For example, the direct-reading spectrometer shown above chemically analyzes a molten heat of Timken forging steel in just 40 seconds. And a complete analysis report is given to the melt shop within 10 minutes! First of its kind in the steel industry, it's just one of the many ways the Timken Company controls quality at every step in production.

Your order for Timken forging steels is handled individually in our mills. We target conditioning procedure to your particular forging requirements. You can hold rejects to a minimum. And you save steel because the good dimensional tolerances of Timken steel forging bars produce uniform weight multiples with a minimum of steel lost in flashings.

You're assured of uniform physical properties, too, when you use Timken forging steels. They respond uniformly to heat treatment—from bar to bar and heat to heat. Fewer furnace adjustments are needed. And Timken forging steels have uniform grain size after heat treatment. Result: forgings made from Timken forging steels have uniformly high ductility and resistance to impact.

For help in improving the quality of your forgings and cutting production costs, write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

METALS

(*Continued from page* 86)

crease of two cents by Anaconda from 32 cents. These three producers account for about 80 per cent of domestic copper output.

In the meantime foreign prices for copper continued to slip. While Chile remained adamant in demanding 36½ cents per lb, both Rhodesian and Congo copper was offered at 32 cents in April with buyers none too eager to do business. It was announced that for the first time in 20 years, Belgian Congo copper would enter U. S. markets, with the first arrival due in April or May. Future shipments were also announced from South Africa. It all adds up that European demand for copper has definitely eased and the United States now offers the most profitable market in the world for the red metal.

Not to be outdone, the custom smelters, confronted with a flood of scrap copper, cut their price 1½ to 2¾ cents per lb, depending on grade, as they tried to bring their bids more in line with the 30 cent price for electrolytic. By the middle of April No. 1 heavy copper scrap was offered at 26½ cents per lb and No. 2 at 23½ cents. Brass manufacturers were adjusting their prices to reflect lower prices for zinc as well as copper.

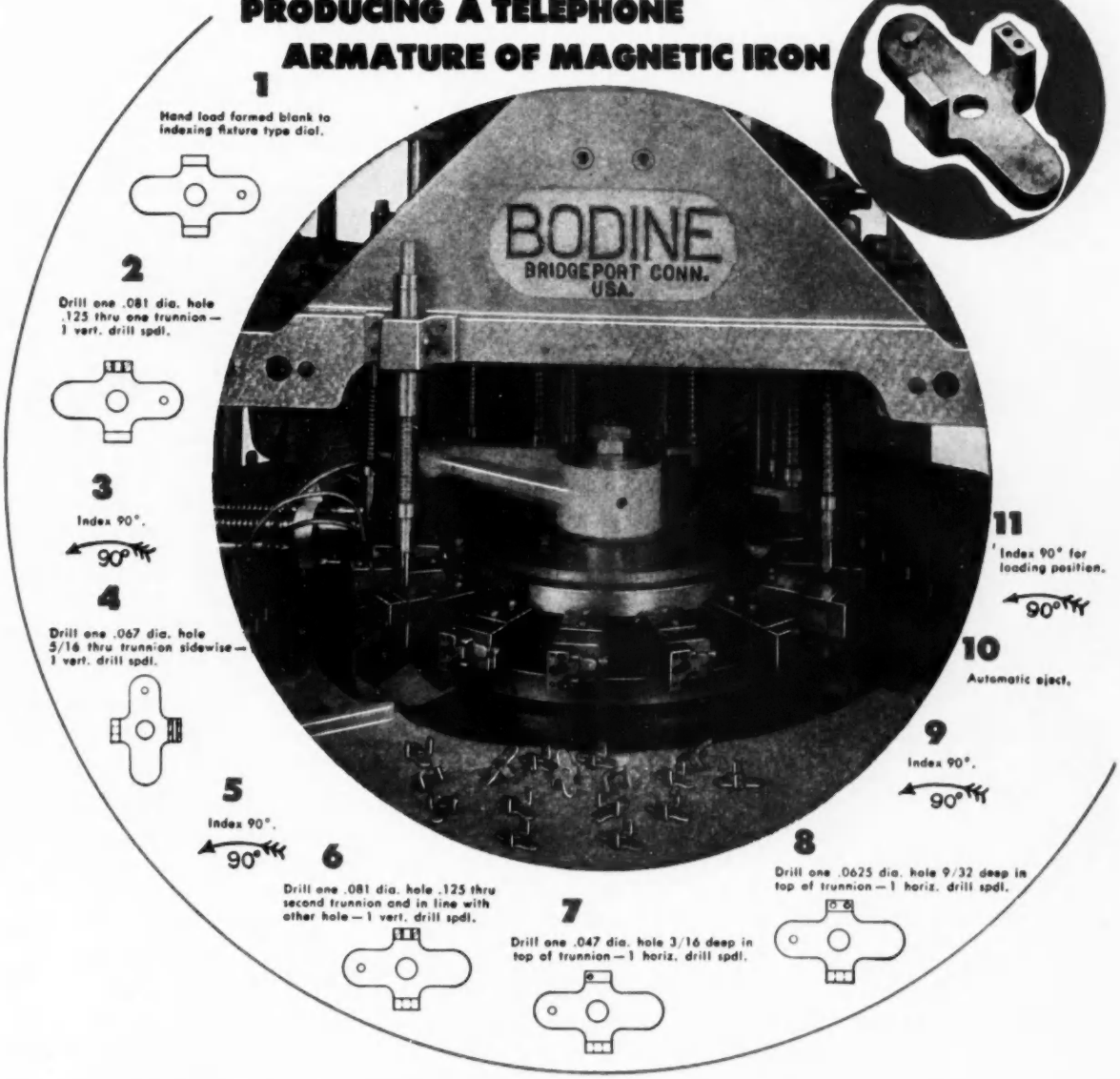
Sentiment is frankly far from optimistic. Lower prices are foreseen as a result of a new influx of foreign metal and continued large receipts of scrap, but more importantly, a fear of a cut in the amount of defense business for brass and wire mills because of a truce in Korea, which has heretofore accounted for about 20 per cent of the total volume of their business. Another element of uneasiness is the likelihood of free trading in copper on the London Metal Exchange now tentatively set for next August. Most observers think that lower world prices will result with resumption of trading in futures, just as happened for lead and zinc.

Lead Weakens Again

Unpredictable lead, after firming up to 13½ cents per lb where it held for a few weeks, again slid back to 13 cents following lower London prices. Imports of lead in January totalled 59,000 tons, a large figure but substantially less than the 94,854 tons that came in December. It is generally believed that inventories of lead in consumers' hands are low and offerings of scrap lead have declined.

Bodine CASE HISTORY NO. 34

PRODUCING A TELEPHONE ARMATURE OF MAGNETIC IRON


1
Hand load formed blank to indexing fixture type dial.
2
Drill one .081 dia. hole .125 thru one trunnion — 1 vert. drill spdl.
3
Index 90°.
90°
4
Drill one .067 dia. hole 5/16 thru trunnion sidewise — 1 vert. drill spdl.
5
Index 90°.
90°
6
Drill one .081 dia. hole .125 thru second trunnion and in line with other hole — 1 vert. drill spdl.
7
Drill one .047 dia. hole 3/16 deep in top of trunnion — 1 horiz. drill spdl.
8
Drill one .0625 dia. hole 9/32 deep in top of trunnion — 1 horiz. drill spdl.
9
Index 90°.
90°
10
Automatic eject.
11
Index 90° for loading position.
90°
BODINE
BRIDGEPORT CONN. USA.

PRODUCTION: The Bodine 42-30 automatic horizontal dial type of machine (one of 6 standard sizes) is equipped with 5 drill spindles (3 vertical, 2 horizontal) and special fixtures which automatically index the work 90° four times during the cycle. Production: 500 pieces (2500 operations) per 50-minute hour at 10 strokes per minute.

ACCURACY: *Alignment of two .081 dia. holes ±.002; other hole locations to within 010; hole diameters held to ±.002.*

WRITE FOR INFORMATION *on high-speed repetitive production with combinations of drilling, tapping, milling, screw inserting, staking, and assembly.*

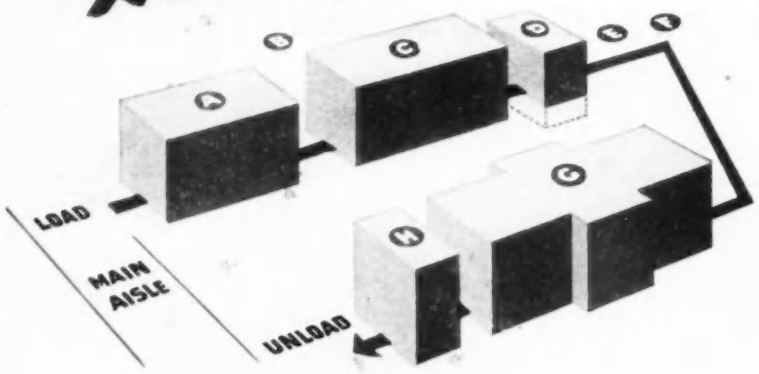
18D53

"You Can't Meet Tomorrow's Competition with Yesterday's Machine Tools."

THE
Bodine
CORPORATION
BRIDGEPORT 5, CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

Heat Treat Furnace Layout by Holcroft... 1st of a Series



- Ⓐ Direct gas-fired normalizing furnace
- Ⓑ Controlled cooling zone
- Ⓒ Direct gas-fired hardening furnace
- Ⓓ Quench tank and elevator for oil or water
- Ⓔ Drain section
- Ⓕ Transfer (and tip over) from drain section to draw furnace
- Ⓖ Indirect gas-fired draw furnace
- Ⓗ Tip-over at discharge end of draw furnace

"Pinch-Hit" Unit backs up 5 Heat Treat Furnaces...

A new furnace layout—designed to bat for five existing furnaces—handles overflow production, replaces any furnace down for repairs, and has the extra capacity for treating war-production forgings of special alloy steels.

Designed by Holcroft, the unit as laid out above, is the buffer behind existing furnaces which normalize, anneal, harden-quench-draw, normalize-harden-quench-draw, or cycle anneal the forging production. A "U-type" layout puts both charge and discharge ends of the unit on a main trucking aisle to simplify material routing.

This is custom engineering at its finest—the type that studies *your* problem and develops the right furnace, or combination of furnaces, for the job. Cost? Let's be realistic: more, perhaps, for a Holcroft furnace—*but much, much less per heat-treated piece.* Write today for more information. Holcroft & Company, 6545 Epworth, Detroit 10, Michigan.

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CLEVELAND 15 — Wallace F. Schott, 1900 Euclid Ave.
HOUSTON 1 — R. E. McArdle, 5724 Navigation Blvd.
CANADA — Walker Metal Products, Ltd., Windsor, Ontario
EUROPE — S. O. F. I. M., Paris 8, France

(*Continued from page* 122)

Battery makers continue to take large tonnages and should shortly step up their orders seasonally as they get ready for the heavy summer demand for replacement units.

Unlike copper and zinc, lead is not essentially a war metal and it should be less affected by any let-down in military demand. Considerable agitation exists for an increase in the lead tariff and a sliding scale duty on imports, starting at a base price of 15½ cents per lb with one cent increase in the tariff for every one cent decline below the base price. This has won wide support from lead producers.

Zinc Remains at Unprofitable Level

Having declined to 11 cents per lb, zinc has held steady at that price without exciting much enthusiasm from buyers. Mine production has declined as was fully expected as a result of an unprofitable price for most producers. March statistics of the American Zinc Institute placed production at 83,485 tons, about 3300 tons more than the monthly average of 1952. Shipments of slab zinc were about 5500 tons more than the average month last year. Stocks of slab in the hands of producers were nearly 100,000 tons at the end of March, highest for over 15 months. Unfilled orders increased to 54,500 tons from 37,100 tons the month before.

It appears quite certain that declining domestic mine output will affect slab production in the near future. The Sullivan Mining Co., a major Idaho smelter, was obliged to cut its output of high grade zinc by 25 per cent because the low price paid for zinc ore had caused marginal mines to close and cut the amount of ore and concentrates coming to the plant.

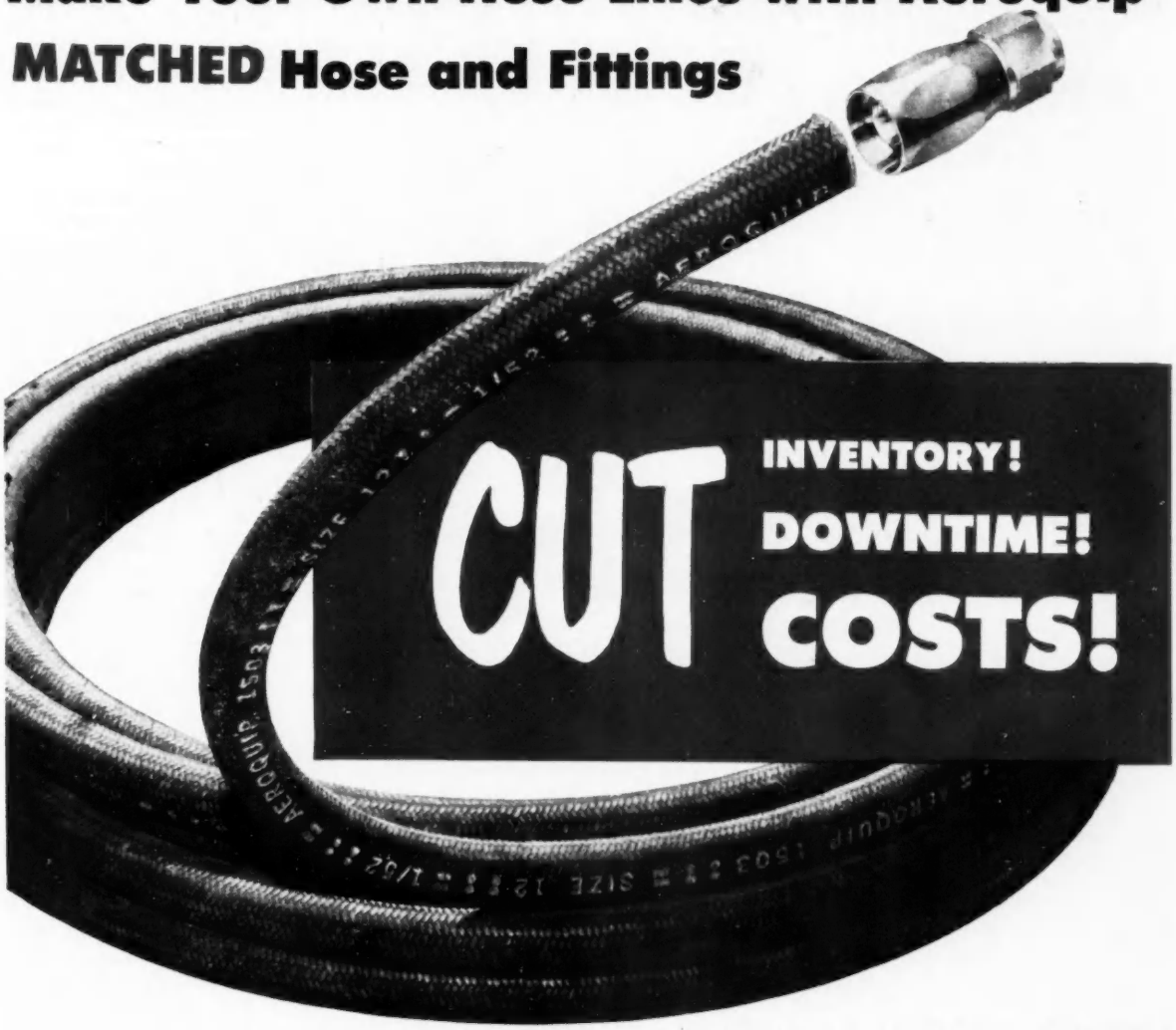
Advocates of a sliding scale tariff for zinc along the same lines as described above for lead find plenty of support from the miners. It is significant that the proposal originated with a major producer of lead and zinc that has large interests abroad as well as in this country.

Disappointment for Tin

For the first time in three years the tin price broke below $1 per lb in mid-April. Following Korean peace talks, the price started to slip from $1.17. It has been as high as $1.84 per lb in early 1951. Singapore prices have been even lower than in New York.

Basically tin is in a poor statistical position and has been for over two

Make Your Own Hose Lines with Aeroquip MATCHED Hose and Fittings



Aeroquip Fittings are designed, developed, and produced to go with Aeroquip Hose. They form such a foolproof combination that Aeroquip *guarantees* performance. Thus, the hose lines made right in your own plant always measure up to Aeroquip's exacting standards of quality, the highest in the industry. A small supply of Aeroquip Bulk Hose and Fittings assures you of quick hose line replacements at all times . . . and Aeroquip Fittings are detachable and may be used again and again when making new hose assemblies.

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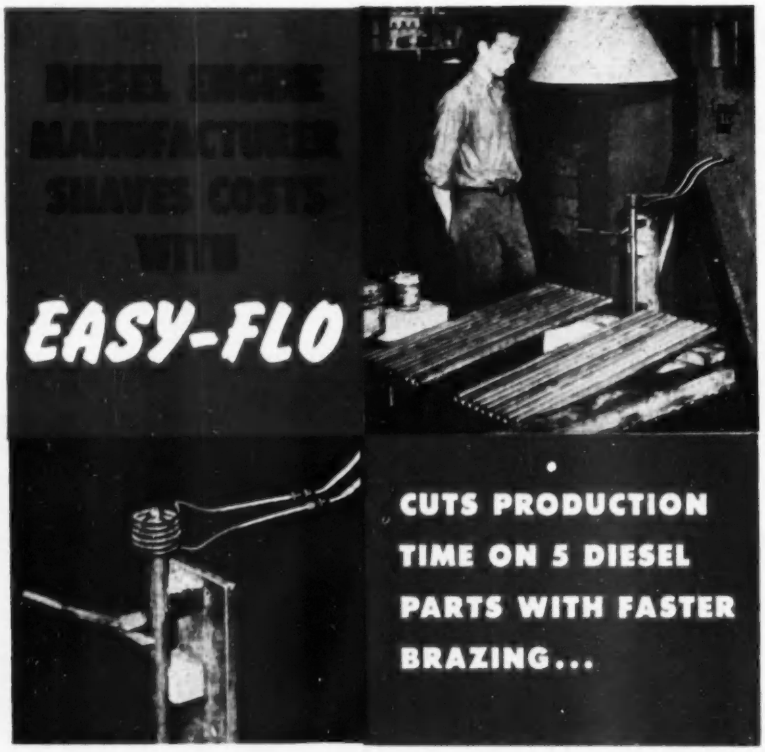

Out at Lima-Hamilton Corp., Hamilton, Ohio, they braze five parts of their 9x12 Diesel locomotive engine. Here are the jobs, the time cycles—also test results quoted from their report.

PART AND JOB	TIME CYCLE	TEST RESULTS
Exhaust rocker arm to shaft induction brazed with a ring of 3/32" EASY-FLO wire preplaced.	318 secs. 2 pieces	"On torque loading the 1¼" rocker shaft twists at 12,000 lbs. No failure of joint."
Intake rocker arm to shaft done same as above.	282 secs. 2 pieces	Same result as above.
Tappet plugs to tappet body, induction brazed with a ring of 3/32" EASY-FLO wire preplaced.	72 secs. each	"Parent metal fails before brazed joint when attempting to press plug from tappet body."
Ball ends to seamless steel tubing push rods, induction brazed with a ring of 1/16" EASY-FLO No. 3 wire preplaced. (Illustrated above)	45 secs.	"Tube bulges before joint failure when attempting to push rod ends out of tubing."
Cup ends to seamless steel tubing push rods done same as above.	50 secs.	Same result as above.

BULLETIN 20 *gives you the how and why you get stronger joints in faster time at lower cost with EASY-FLO low-temperature silver alloy brazing. Write for your copy today.*

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years, with world production exceeding consumption by a large margin. Total world output in 1952 is estimated about 167,000 tons, which was 50,000 tons more than consumption. The U. S. Government stockpile alone is believed to be sufficient for several years at the normal consumption rate of 70,000 tons annually.

While $1 per lb for tin cannot be called a high price when postwar inflation is considered, there is little reason to hope for improvement, and lower prices appear indicated until effective steps are taken to restrict output. This may cause revival of the old international tin cartel that operated successfully before the war.

News of the MACHINERY INDUSTRIES

(*Continued from page* 74)

the machine tool builders would be very foolish to rely on the proposals in the Government report as a guarantee of business for the industry. The report gives three sources and an estimate of the amount of business that the industry might expect from these sources for the next several years.

First, normal commercial business of $300 million per year.

Second, additional productive equipment in lieu of vast reserves of long lead-time military hardware estimated at something between $200 and $500 million.

Third, additional expenditures by the Government in the form of replacements which would be required to keep and maintain our productive capacity modern and up-to-date. This is estimated at $300 million per year.

Mr. Howe stated that the third classification which is estimated to be in the neighborhood of $300 million must be considered extremely nebulous. The estimate seems to be entirely in the realm of pure conjecture. If the third classification is eliminated and it is assumed that there will be at least a partial implementation of the Vance proposals, the machine tool industry can expect at least in the next year or two, not much over $500 to $600 million of new business. This is approximately half of the current rate of operations.

Air Gaging Dodge Blocks

At the main plant of the Dodge Div., Chrysler Corp., the pistons and the cylinder bores in the 140 hp V-8 engine are measured and classified

ELMES INCLINED FORCING PRESS

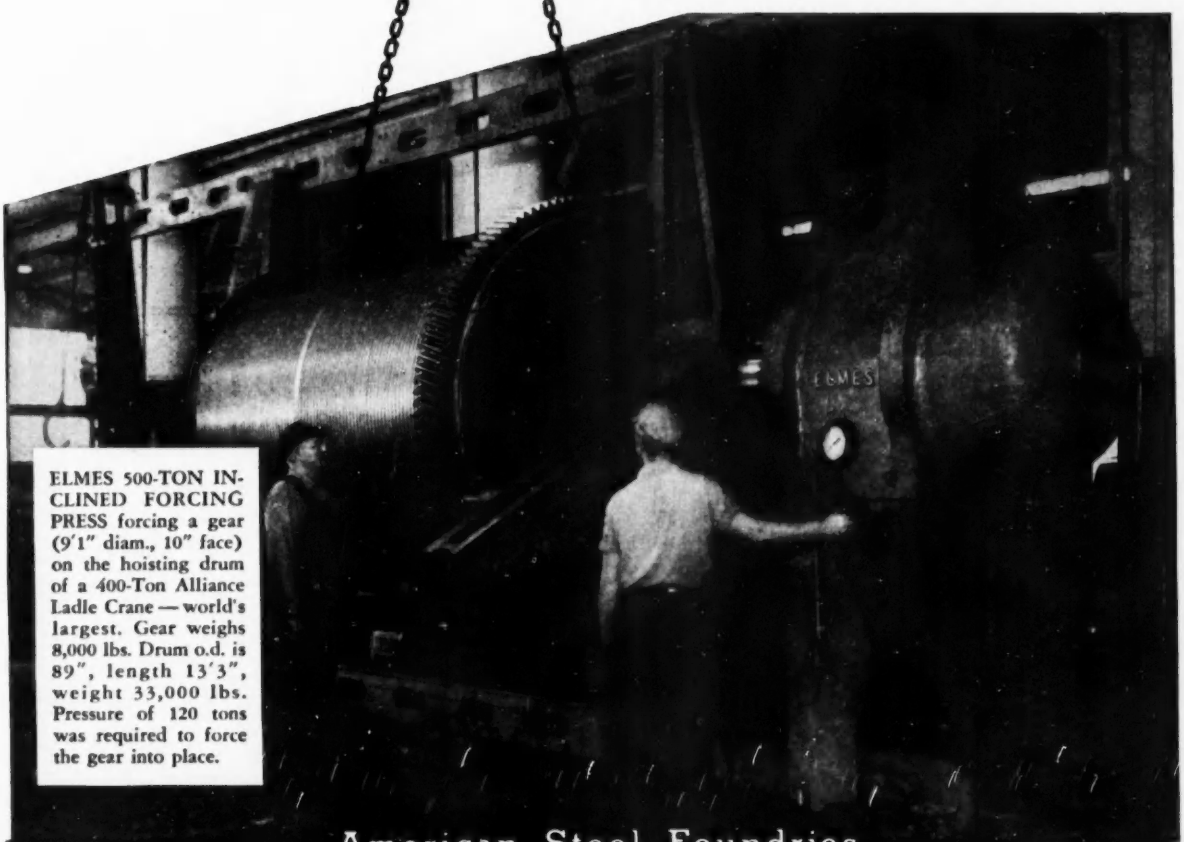
makes this tough job easy . . . and saves 50%!

Forcing the Gear on Hoisting Drum of World's Largest Ladle Crane at The Alliance Machine Company

The Alliance Machine Company, Alliance, Ohio, builder of the world's largest cranes, gives credit to the Elmes Inclined Forcing Press shown below for making possible a *50% saving* on gear installation costs.

By their performance, Elmes Inclined Forcing Presses have earned an outstanding reputation as sturdy tools of production. Built in capacities from 100 to 1000 tons, these rugged, dependable presses are ideal for forcing heavy wheels, gears and pulleys on and off shafts; for inserting and removing bushings; for many other uses in manufacturing and maintenance.

Is your plant doing jobs like these the hard way—the costly way? Why not look into the advantages of an Elmes Forcing Press? They make the tough jobs easy. Your Elmes Distributor can give you details. Write for Elmes Bulletin No. 1055-A. It illustrates and gives major specifications on the complete line of Elmes Hydraulic Forcing Presses . . . Horizontal, Vertical, and Inclined.



ELMES 500-TON INCLINED FORCING PRESS forcing a gear (9'1" diam., 10" face) on the hoisting drum of a 400-Ton Alliance Ladle Crane — world's largest. Gear weighs 8,000 lbs. Drum o.d. is 89", length 13'3", weight 33,000 lbs. Pressure of 120 tons was required to force the gear into place.

American Steel Foundries

ELMES ENGINEERING DIVISION

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DISTRIBUTORS IN PRINCIPAL INDUSTRIAL CENTERS — ALSO MANUFACTURERS OF GEARING

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for selective assembly. Two cylinder bore gaging and classifying machines, manufactured by the Sheffield Corp., Dayton, Ohio, are used to measure and classify bore diameters, to inspect out-of-roundness and taper, and to stamp the classification of each bore on the pan rail.

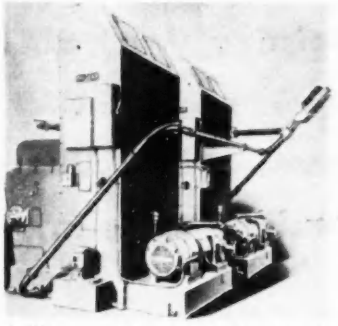
Each machine gages simultaneously the four bores in one bank of a V-8 block. After one bank has been checked, the operator swings the turntable around to check the other bank. On each side of the gaging unit is a light panel for use in visual inspection of the bores.

Four air spindles, motorized for rapid travel into and out of the bores, explore the full length of the bores. Each spindle has two diametrically opposed air jets at four positions along the length of the spindle. Each pair of air jets is connected to a glass column in the Precisionaire.

Size, out-of-roundness, and taper are indicated by the position of the floats in the 16 column Precisionaire. A scale beside each glass tube shows in which one of the six classifications a bore belongs. A stamping device mounted above each bore is used to manually mark the size of the bore on the pan rail.

On rare occasions, a bore may taper too much or contain an obstruction restricting the upward movement of the air spindle. Instantly a red light above the bore is turned on; a white light indicates spindles retracted.

When spindles are at the top of the bores, they are rotated 180 deg to check out-of-roundness. Taper is indicated by comparison of four float positions for each of the four cylinder bores.



A Hapman chip conveyor has recently been applied to a vertical broaching machine. The conveyor automatically removes chips from the broaching operation to maintain a clear area around the workpiece and the tool.

(*Turn to page* 130, *please*)

Reduce SHUT-DOWN Costs

FOR PERIODIC MACHINERY INSPECTIONS

Inspecting inking rolls on a printing press . . . without disassembly.

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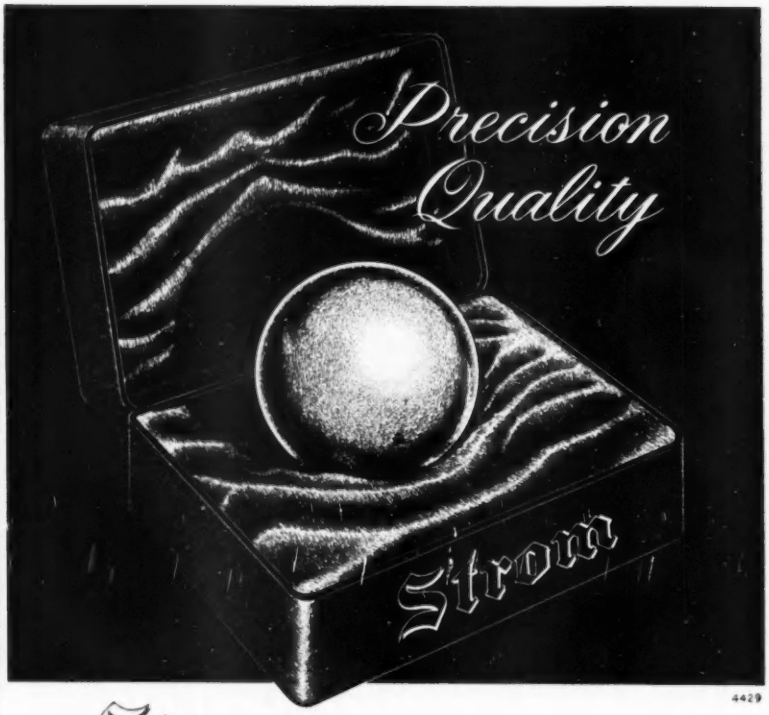
CITY _____
ZONE _____ STATE _____



4429

Stroom STEEL BALL CO.

Largest Independent and Exclusive Metal Ball Manufacturer

1850 SO. 54th AVE., CICERO 50, ILLINOIS

MORE Point of Sale!

More sales like this through authorized distribution channels mean more profits for our customers. The C. M. HALL LAMP COMPANY, a key supplier of automotive lighting equipment, provides *only* its customers with production, service and accessory parts . . . competitive channels are *never* supplied. All HALL-made products are sold through the original equipment manufacturer and from them to their resale channels. This practice insures manufacturer and dealer of 100% of the rich replacement market profits.

With its subsidiary, INDIANA DIE CASTINGS, C. M. HALL makes and assembles over 200 different kinds of transportation lights. For nearly half a century, HALL has been contributing—through its products and practices—to *America's Vision for Transportation.*

Bright-spot in the Transportation Center!

C.M. HALL Lamp Company

Vision for Transportation

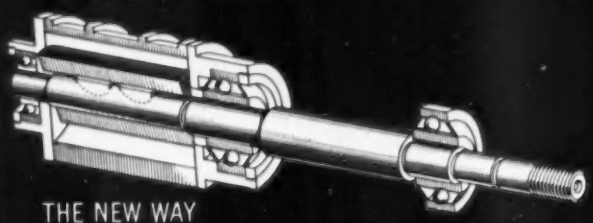
1035 EAST HANCOCK AVENUE • DETROIT 7, MICHIGAN

and its wholly-owned subsidiary INDIANA DIE CASTINGS, INC. ELWOOD, INDIANA

When you look at air tools . . . LOOK INSIDE

THE OLD WAY

A two-piece shaft, with male and female tang drive; double bearings required at center of tool.



THE NEW WAY

A one-piece shaft, with keys to drive the rotor which "floats" on the shaft; only one bearing needed at center of tool.

An ordinary air tool has a two-piece shaft, joined by a male and female tang. This tang drive is subject to excessive wear, even when double bearings are used for support. When wear occurs, it means replacement of the entire shaft, and an expensive rotor.

A Buckeye air tool has a one-piece shaft, connected to the rotor by two keys; the rotor "floats" on the shaft. The keys are not subject to as much wear as the tang drive, and even when wear does occur, the keys are easily replaced at very low cost. The shaft and rotor continue in service.

The point is simply this: you can expect better service—at lower cost—from your Buckeye tools.

What are you waiting for?

Buckeye Tools CORPORATION

DIVISION 21 • DAYTON 1, OHIO

Portable Air and Electric Tools for Industry

IN CANADA: Joy Manufacturing Co. (Canada) Ltd., Galt, Ontario

(Continued from page 128)

Automation Featured at Westinghouse Forum

At the 17th Annual Westinghouse Machine Tool Electrification Forum last month the theme centered around automation and the various electrical controls utilized to automate machine tools. K. M. Patterson, manager, Westinghouse Industrial Department, in the opening address, stated that from 10 to 30 per cent of machine tool cost can be for electrical equipment.

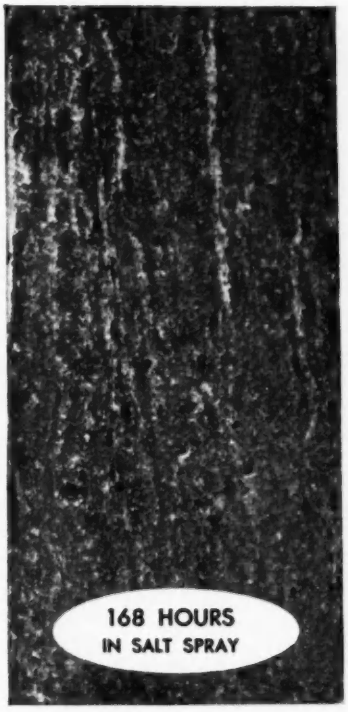
Speaking on automation at the Ford Motor Co., R. Juengel stated that all machines, when possible, should be designed as in-line "thru" units. It is almost impractical to design automation for the "in-and-out" type of machine, and is impossible as far as high production is concerned, according to Mr. Juengel. He went on to say that the part should never have to unload by reversing the path through which it loaded. It would facilitate the application of automation to always have the load and unload stations removable, and in many cases left off entirely.

All work stations, insofar as possible, should be interchangeable so that in the event of development of serious trouble in a leg, or of a change in machining sequence, a new station can be inserted or the existing stations interchanged without impossible complications in automated machines, according to Stanley I. Rice, The Heald Machine Co., Worcester, Mass., who gave a paper on automation and the transfer type of machine.

A unique automatic loader for LeBlond crankshaft lathes was described by Nelson D. Cooper, R. K. LeBlond Machine Tool Co., Cincinnati, Ohio. These lathes are machining shell-molded crankshafts at the rate of 46 to 50 per hour at the Cleveland Engine Plant of the Ford Motor Co.

The application of telephone equipment to machine tool control was discussed by H. E. Grimes, the Avey Drilling Machine Co., Covington, Ky. He described an Avey machine containing some of the telephone switches. The machine is used to produce a military item—a ring with 15 equally spaced holes that are drilled radially, milled with two cross slots per hole, back countersunk, and tapped. A 15-station index table is used to rotate the part.

Kurt O. Tech, The Cross Co., Detroit, Mich., spoke on coordinating the efforts of electrical, mechanical and hydraulic designers. According to Mr. Tech, the Cross electrical engineering department is not only re-



Panel of bare 24ST Aluminum, untreated. Extensive corrosion after 168 hours in salt spray.

Panel of bare 24ST Aluminum, treated with Bonderite 710. No corrosion after 168 hours in salt spray.

Panel of bare 24ST Aluminum, treated with Bonderite 710. In excellent condition after 1008 hours in salt spray.

SALT SPRAY TESTS SHOW CORROSION RESISTANCE

ALUMINUM gets increased corrosion resistance, greater durability for paint, with BONDERITE* 710

Here's the surface treatment that practically ends the problem of corrosion on aluminum. Even on high-strength alloys, most susceptible to corrosion, Bonderite 710 protects bare metal for amazingly long periods without failure. Its performance as a base for paint is outstanding.

Bonderite 710 produces an amorphous chromate coating on aluminum surfaces. It can be applied by spray, immersion, or brush, on sheets, castings, forgings and extruded and rolled forms. It operates at low temperatures and is sludge-free.

Bonderite 710 is a liquid—safer and easier to handle, easier to use, more positive in results.

This product's performance equals (*exceeds,* in most important requirements) the government specifications for chemical treatment of aluminum and its alloys.

For bare corrosion resistance, or as a corrosion-resistant base for paint, investigate Bonderite 710 for aluminum.

SEND FOR FREE TECHNICAL BULLETIN—Write today for FREE illustrated bulletin on "Bonderite 710 for Aluminum".

FIRST SINCE 1915

Parker

RUST PROOF COMPANY

2178 E. MILWAUKEE, DETROIT 11, MICHIGAN

BONDERITE—corrosion resistant paint base

BONDERITE and BONDERLUBE—aids in cold forming of metals

PARCO COMPOUND—rust resistant

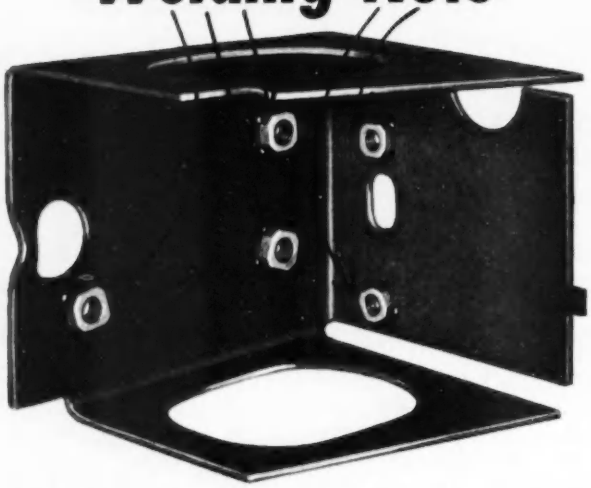
PARCO LUBRITE—wear resistant for friction surfaces

**Bonderite, Bonderlube, Parco, Parco Lubrite—Reg. U.S. Pat. Off.*

IMAGINE TRYING TO GET IN HERE TO HOLD NUTS!

No Problem At All With . . .

MIDLAND
Welding Nuts



With Midland Welding Nuts pre-mounted* in inaccessible places, there is no need to hold the nuts while attaching other parts.

*THIS IS ALL YOU DO — Just insert collar of Midland Welding Nut in hole for bolt or screw, resistance weld the Nut in place, and the Nut is there for the life of the job. Nuts can be fed automatically to the resistance welder.

Write for facts about these better connections at less cost.

The MIDLAND STEEL PRODUCTS COMPANY

6660 Mt. Elliott Ave. • Detroit 11, Michigan

Export Department: 38 Pearl St., New York, N. Y.

Manufacturers of

AUTOMOBILE AND TRUCK FRAMES | AIR AND VACUUM POWER BRAKES | AIR AND ELECTRO-PNEUMATIC DOOR CONTROLS

sponsible for the circuits and the selection of electrical components, but also for the relationship which those components have with any phase of a mechanical and a hydraulic design. It was further stated that current trends toward the automatic production line will depend largely upon the ability to control down time.

Speaking before the 327 people in attendance at the Westinghouse luncheon, Tell Berna, general manager of the NMTBA, said there are 2 million machine tools in the U. S. If industry purchased just 66,000 tools per year, it would take approximately 30 years to replace every tool now in production. However, total machine tool sales currently run around 47,000 units with 10 per cent of those going to foreign users. At this rate, it will take American industry from 45 to 50 years to bring itself up-to-date. Mr. Berna forecast a new cycle for the machine tool industry, in which machines to cut the production cost of civilian goods will supplant machines for national defense as the major source of the industry's business.

Machine Tool Expansion

Expansion of the machine tool industry and its demand on the manpower supply is slowing down, according to a recent survey by the Labor Dept. Officials said the survey showed that the expansion program has reached a point where the industry can meet both military and civilian demands.

Employment by the industry increased another four per cent during 1952 to a total of 107,000 workers. Overall employment by the industry since start of the mobilization program is about 70 per cent. On the other hand, production has increased by 4½ times, the report indicates. Shipments in 1949 amounted to $249 million, increasing to $1.1 billion for 1952.

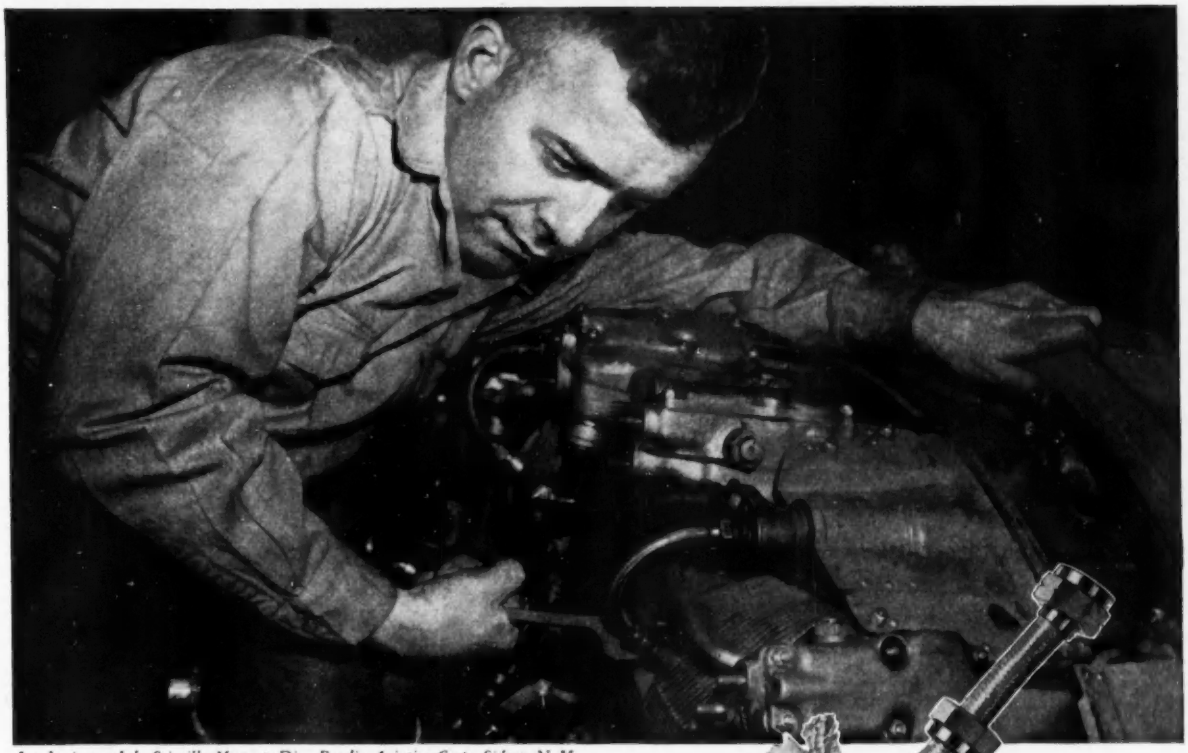
Machine Tool Caravan

A railroad car with 14 of the latest British machine tools, distributed by British Industries Corp. in the U. S., currently is on a nation-wide tour of industrial centers. The $100,000 worth of machines have been set up for actual operation. Most of the equipment is of the toolroom variety and, according to the distributor, each machine was chosen because it has some unique feature or quality.

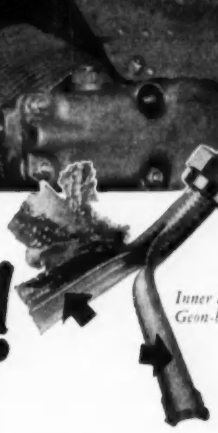
Read AUTOMOTIVE INDUSTRIES

Another new development using

B. F. Goodrich Chemical *raw materials*



Lead-wire made by Scintilla Magneto Div., Bendix Aviation Corp., Sidney, N. Y.
B. F. Goodrich Chemical Co. supplies the Geon paste resin for the plastisol compound only.



Inner lining of Geon-based plastisol.

Wired for Safer Flying!

Geon helps protect new lead-wire assembly

AIRCRAFT engine lead-wires for carrying high voltage from the transformer coil to spark plug were rubber covered nickel braid. They frequently deteriorated quickly from the effects of ozone and engine heat. Result —*higher* maintenance costs, *lower* safety factor.

After months of experimenting, engineers came up with the answer: a lead-wire with an inner lining of plastisol made from Geon paste resin, plus two other layers of plastisol between the nickel braid.

This lightweight, vinyl plastic impregnated lead-wire has the strong, waterproof, *ozone and heat-resistant* protection that was needed. A flexible metal tube insert for enclosing the wires is no longer required. And this Geon-helped lead-wire also resists the effects of *mineral spirit solvents* which are flushed on the engine during cleaning operations.

Plastisols made from Geon paste resin can be molded, cast, coated or dipped. They can be made resistant to oils, greases, heat and cold, abrasion and many chemicals. Perhaps Geon paste resin, or other Geon materials, can help you improve or develop more saleable products. For technical bulletins, please write Dept. HG-5, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

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You may have heard about a highly successful solid-film lubricant which is giving remarkable results in the shop and in the field.

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Barnes and Reinecke, Inc., Chicago engineering company, specializing in mechanical research and development, was acquired by Joy Mfg. Co., large Pittsburgh maker of mining equipment and a growing variety of industrial products. Barnes and Reinecke will continue to operate under its present name and with its present personnel as a subsidiary of Joy.

CALENDAR

OF COMING SHOWS AND MEETINGS

9th Annual Forum, American Helicopter Society, Mayflower Hotel, Washington, D. C. .....May 14-17

Cam Design and Tool Selection Conference, Rochester Inst. of Technology, Rochester 8, N. Y. Single Spindle Group .....May 18-20 Multiple Spindle Group ....May 20-22

Fifth Materials Handling Exposition, Convention Hall, Philadelphia, Pa. .....May 18-22

5th Annual Management Clinic, Society for Advancement of Management, Rackham Memorial, Detroit, Mich. .....May 20-21

Society for Experimental Stress Analysis, Spring Meeting, Hotel Schroeder, Milwaukee, Wis..May 20-22

Society of Photographic Engineers, Third Annual Conference, Hotel Thayer, West Point, N. Y...May 20-22

American Gear Manufacturers Association, Annual Meeting, The Homestead, Hot Springs, Va. May 30-June 3

1st Annual Michigan Motor Show, State Fair Grounds, Detroit..June 2-7

SAE Summer Meeting, The Ambassador and Ritz-Carlton, Atlantic City, N. J. .....June 7-12

2nd International Aviation Trade Show, Hotel Statler, New York, N. Y. .....June 9-11

Exposition of Basic Materials for Industry, Grand Central Palace, New York, N. Y. .....June 15-19

14th Iowa Management Course, State U. of Iowa, Iowa City..June 15-27

Motor Vehicle Fleet Supervision Course, Northwestern U. Traffic Institute, Evanston, Ill. ....June 22-26

Motor Fleet Supervisor Refresher Seminar, Northwestern U. Traffic Institute, Evanston, Ill..June 25-26

20th International Aeronautical Meeting, Le Bourget Field, Paris, France .....June 26-July 5

American Society for Testing Materials, Chalfonte-Haddon Hall, Atlantic City, N. J....June 29-July 3

Sixth Annual International Aviation Exposition, Detroit, Mich. ..July 9-12

National Aircraft Show and 50th Anniversary of Powered Flight, Vandalia Airport, Dayton, O..Sept. 5-7

Eighth National Instrument Conference and Exhibit, Chicago, Ill. .....Sept. 21-25

SHORTIES

It has been estimated that it will cost about $30 million to develop a U. S. jet transport prototype. Production models cast from the prototype may cost in the neighborhood of $2 million to $4 million each, depending on size and quantity produced. Present four-engined transport aircraft cost about $1 million to $1.7 million each.

•

Since Jan. 1, 1941, the number of farm tractors has increased about 150 per cent, while motor trucks on farms have risen 120 per cent.

•

Sixteen entirely new aircraft models will be put into production by the U. S. aircraft industry in the next three years.

•

In 1952 total federal, state and local taxes—direct and hidden—came to $84.6 billion. Total food and clothing purchases of Americans were only $81 billion.

•

In one year of body building a major manufacturer performs 1.1 billion spot welds, 129.25 million in. of gasweld, 37.4 million in. of heli-arc weld, and 10.45 million in. of arc weld.

•

A group of engineers states that spark plugs must operate in 1500 deg temperature, giving up to 2000 sparks a minute, and withstanding explosive pressures as high as 500 lb per sq in.

•

It would take 609 million watts to light all the bulbs that are installed in one year in automotive lighting equipment by one manufacturer.

•

The U. S. Bureau of Labor Statistics reports that, except for chemicals, motor vehicles have increased less in price during the past decade than any other major commodity group.

For Comfort... for Safety...

FOR LOWER COST PER TON MILE!

A truck driver, like *any* driver, wants to be comfortable . . . to stay *dry*, untroubled by the drip and spatter of storm-driven rain coming in through leaking windshields and fixed windows. And he'll be a *safer* driver with that protection. *Also* . . . the truck will be on the road *more* and in the shop *less*, reducing the vital *ton-mile cost* of hauling cargo.

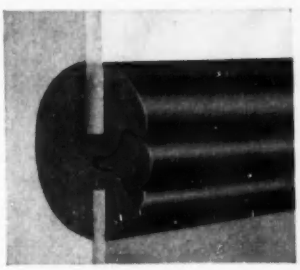
That's why Inland Self-Sealing Weather Strip is used on so many trucks, buses and cars. It's *permanent* weatherproofing . . . using the basic Inland principle of resilient rubber, constantly compressed . . . a seal that locks itself for keeps, without cement or binders. It *never* leaks!

Inland Strip is *best* for the builder . . . a fast, one-man, low-cost installation. And *best* for the user . . . long-lived, trouble-free, inexpensive when replacing broken glass.

INLAND MANUFACTURING DIVISION
General Motors Corporation • Dayton, Ohio

Here's how it works!

Inland Strip goes into body panel or other opening . . . glass into Strip . . . filler strip into locking channel. *A compression seal that's complete and permanent!*



INLAND MANUFACTURING

Self-Sealing WEATHER STRIP

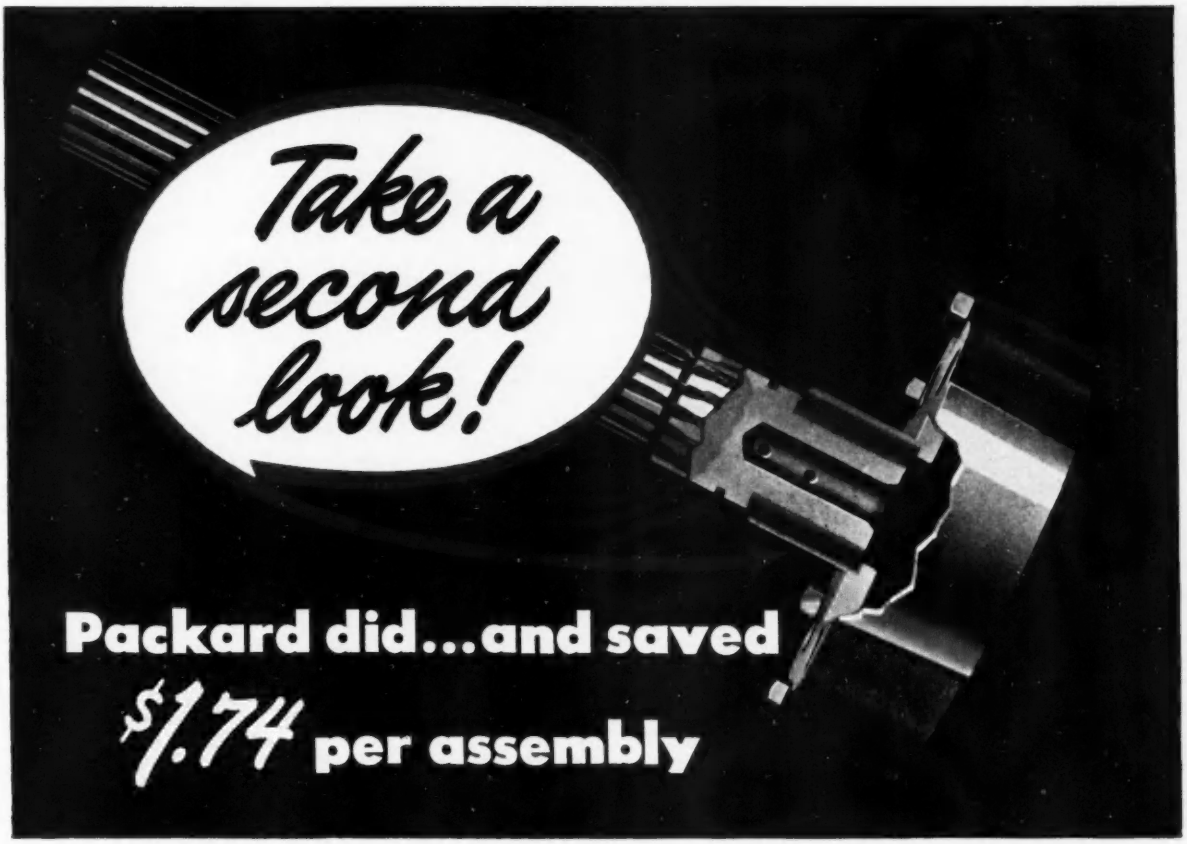
Wha-at! Cleaner than a hound's tooth?

No wonder old Buster is amazed . . . all his life he has proudly thought that "Cleaner than a hound's tooth" was about as clean as they come. Northwest's cleaning specialists know better. They know that even a gleaming, spic and span surface is not to be trusted.

When parts to be finished are cleaned the Northwest way they are cleaner than clean. All surfaces, even the deep recesses, are free from soil and chemically scrubbed so they'll "wet out" completely, assuring perfect adhesion and fewer expensive rejects.

Remember, the best finishing job on earth can be no better than the CLEANING JOB beneath it. Why not play safe with "job adjusted" Northwest cleaners and personalized service?

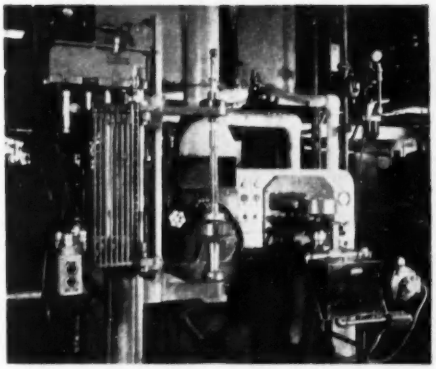
Got a problem? Let our cleaning experts help you!



with TOCCO* Induction Brazing

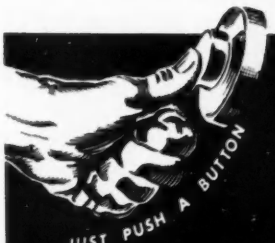
THIS is the "planetary output shaft" for the Packard Ultramatic Transmission. It was originally designed to be made from a forging, but Packard engineers "took a second look" and determined that a slight design change, using a casting and a steel shaft, permitted taking advantage of Induction Brazing. This resulted in a savings of $74,325 in the equipment and tooling for production, in addition to the actual labor and materials savings of $1.74 per assembly.

When designing *your* new product, or redesigning present products for more economical manufacture, you will profit by considering TOCCO Induction Heating for brazing, hardening, soldering, forging or shrink-fitting. Designing for Induction Heating pays off!



A 30 KW, 10,000 Cycle TOCCO Unit Brazes 45 Assemblies per hr.

THE OHIO CRANKSHAFT COMPANY



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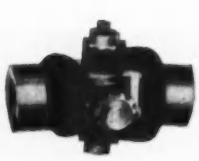

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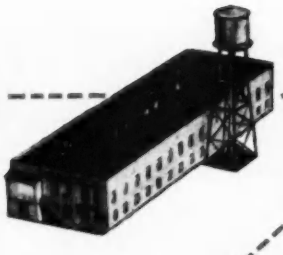

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learned they could

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	Maximum Torque Inch Pounds	
	Cont. Load	Hand Oper.
K Series K2R Series	350	2,000
K-1-C	350	2,000
K-2-A	350	5,000
L6S Series L6N Series	400	2,000

	Recommended Torque Rating, Inch Pounds	Needle Bearings
L10S Series	650	Opt.
1FR Series	1,080	"
L14S Series	1,230	"
3DR Series	1,800	"
L16S Series	2,200	"
L14N Series	4,500	"
35N Series	10,000	"

FOR TRUCKS AND BUSES

N Series	Recommended Torque Rating, Inch Pounds	Balanced for
45N	14,000	3600
5N	20,000	R.P.M.
50N	20,000	Max.
6N	38,000	"
60N	38,000	"
7N	57,000	"
70N	57,000	"
75N	70,000	"

FOR MARINE AND INDUSTRIAL EQUIPMENT

BW Series	Maximum Torque Inch Pounds Cont. Load	Momentary Load
BW-12	1,020	4,450
BW-1	1,695	7,500
BW-2	3,350	11,720
BW-3	4,450	16,800
BW-4	5,080	22,900
BW-5	8,640	34,200
BW-6	11,620	60,000
BW-7	28,600	150,000
BW-9	89,300	500,000

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UNIVERSAL JOINTS AND DRIVE LINE ASSEMBLIES

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In the search for faster, better ways of digging out the earth's many mineral treasures, designers of mining machines and equipment are finding OSTUCO Tubing the ideal solution to countless problems.

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It will pay you to consult our experienced engineers about OSTUCO Tubing for your current needs or for redesigning your products to meet future competition.

From Your Blueprint . . . to Your Product
OSTUCO TUBING
Tapering • Swaging • Flanging • Bending
Upsetting • Expanding • Reducing • Beading
End closing • Spinning • Drilling • Sloming
Notching • Flattening • Shaping • Trimming
Threading • Angle Cutting • And Many Others

THE OHIO SEAMLESS TUBE COMPANY

Manufacturers and Fabricators of Seamless and Electric Welded Steel Tubing

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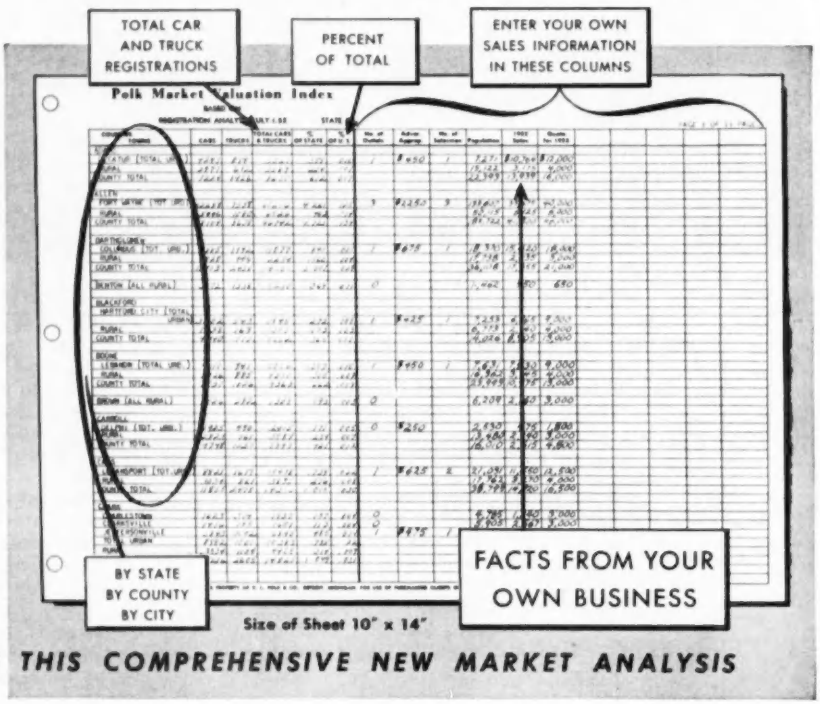
What were YOUR sales for '52 in Adams County?

Did you get
YOUR SHARE
of the market?

CHECK the facts against total car and truck registrations

POLK MARKET VALUATION INDEX

R. L. Polk & Co., for years compilers of the official car registrations, now make this basic sales information available on special work sheets set up market by market, county by county, city by city, with column headings under which you can post your own sales figures, expenditures, and quotas. Compare instantly your performance figures against actual car and truck registrations. Write, wire or phone for complete information.


TOTAL CAR AND TRUCK REGISTRATIONS
PERCENT OF TOTAL
ENTER YOUR OWN SALES INFORMATION IN THESE COLUMNS
Polk Market Valuation Index
BY STATE
BY COUNTY
BY CITY
FACTS FROM YOUR OWN BUSINESS
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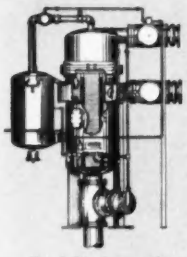
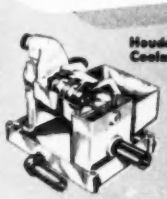
give your production dollars a 2-WAY STRETCH !

with HONAN-CRANE equipment

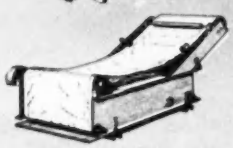
you can CUT COSTS and INCREASE PRODUCTION on all types of metal working operations



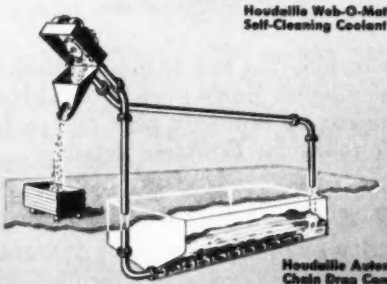
Houdaille Automatic Coolant Clarifier



Houdaille Magnetic Coolant Filter

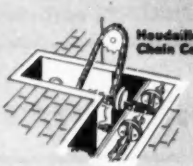


Houdaille Web-O-Matic Self-Cleaning Coolant Filter



Houdaille Automatic Chain Drag Conveyor

Houdaille Automatic Pan Type Conveyor



Houdaille Open Trough Chain Conveyor

Houdaille Slat Type Trough Conveyor

...the equipment:

Houdaille Automatic Filters

Keep oils and coolants clean, free from abrasive contamination, safe to use indefinitely. Complete line, including magnetic, web and clarifier types, for individual machine tools and central systems.

Houdaille Automatic Conveyors

Provide low-cost removal and transport of chips, sludge, etc., to disposal point. Houdaille Conveyors are engineered for each type of metal-working waste handling problem.

...the results:

Honan-Crane Equipment steps up the efficiency of modern automatic plant operations . . . quickly pays for itself out of savings resulting from: • Fewer Product Rejects—Increased Production • Longer Tool and Wheel Life • *Much* Lower Maintenance Costs • Reduced Oil and Coolant Costs

write for full information

Illustrated Bulletins describing Honan-Crane equipment, typical installations and Metal Working Case Histories will be sent on request.

Honan-Crane Corp.
404 Madison Ave., Lebanon, Indiana
A subsidiary of
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ALL HONAN-CRANE EQUIPMENT IS SOLD ON A PERFORMANCE GUARANTEED BASIS

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A COMPLETE SHEET METAL DIE SERVICE...

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- *Plastic die*

NEED a completely-accurate, experimental plastic die? A dependable, short-run zinc alloy die? Or a high-production iron die?

You'll find Allied to be the only plant in the country able to provide you *the complete service* which includes all three kinds.

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Remember, too, that any of these materials — plastic, zinc alloy or iron — can be combined to give you maximum economy plus top performance. Write today for complete details.

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PLANT 3
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For light, medium, or heavy-duty service, there's an Exide battery for every automotive need, gas or diesel. Exide batteries give sure-fire starting in all kinds of weather—in automobiles, trucks, tractors, off-the-highway equipment, aircraft, and motor boats. They offer outstanding, year-round performance . . . at lowest cost per battery-mile.

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Whatever you make—if it's battery-equipped, there's an Exide to get it off to a good start. Exide engineers will be glad to work with you on any of your storage battery problems.

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for light, medium, or heavy-duty service

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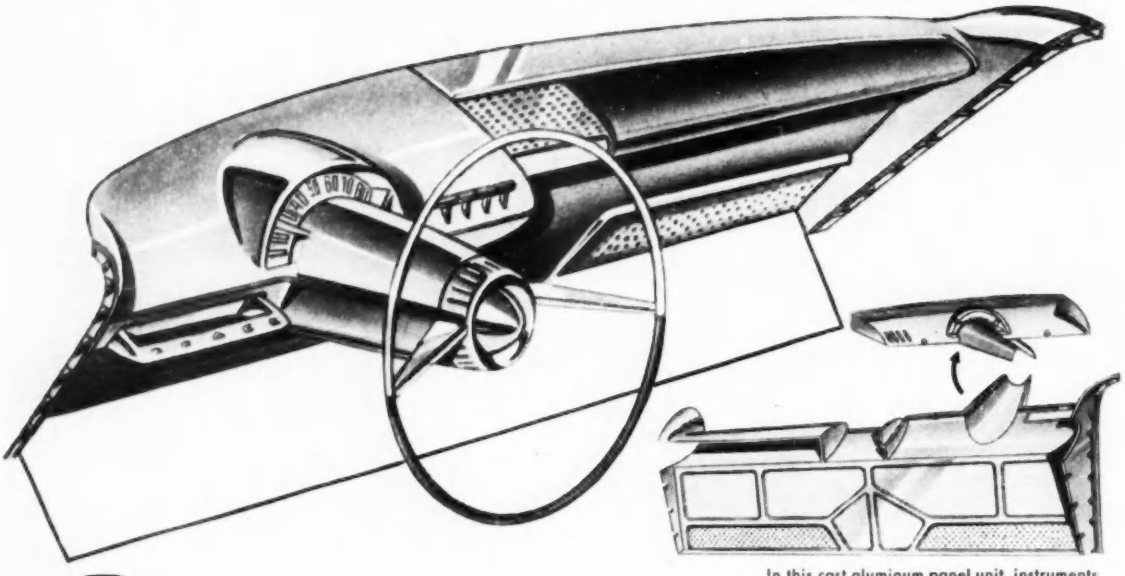
Aluminum takes to the highways



In this cast aluminum panel unit, instruments are inserted from back, panel is installed quickly, top piece is removable for easy servicing of instruments. Vents and radio openings are cast right into panel.

Reynolds looks forward with America's Foremost Designers

William Flajole

Designer and builder of the Ted Williams special Nash-Healy and the Nash NXI. Has designed yachts, toys, radios, refrigerators and other products. Consultant to Nash-Kelvinator Corporation and other companies.

This aluminum instrument panel and firewall designed by Mr. Flajole puts aluminum's light weight, natural attractiveness and ease of assembly to good advantage. Mr. Flajole says, "aluminum reduces weight by almost two-thirds. Aluminum has a beautiful sheen and can be used here where chrome would reflect too much light into eyes. Aluminum eliminates expensive overlays to get texture and detail . . . all this is inherent in the casting." Aluminum also lends itself to ease of assembly as noted in Mr. Flajole's design above.

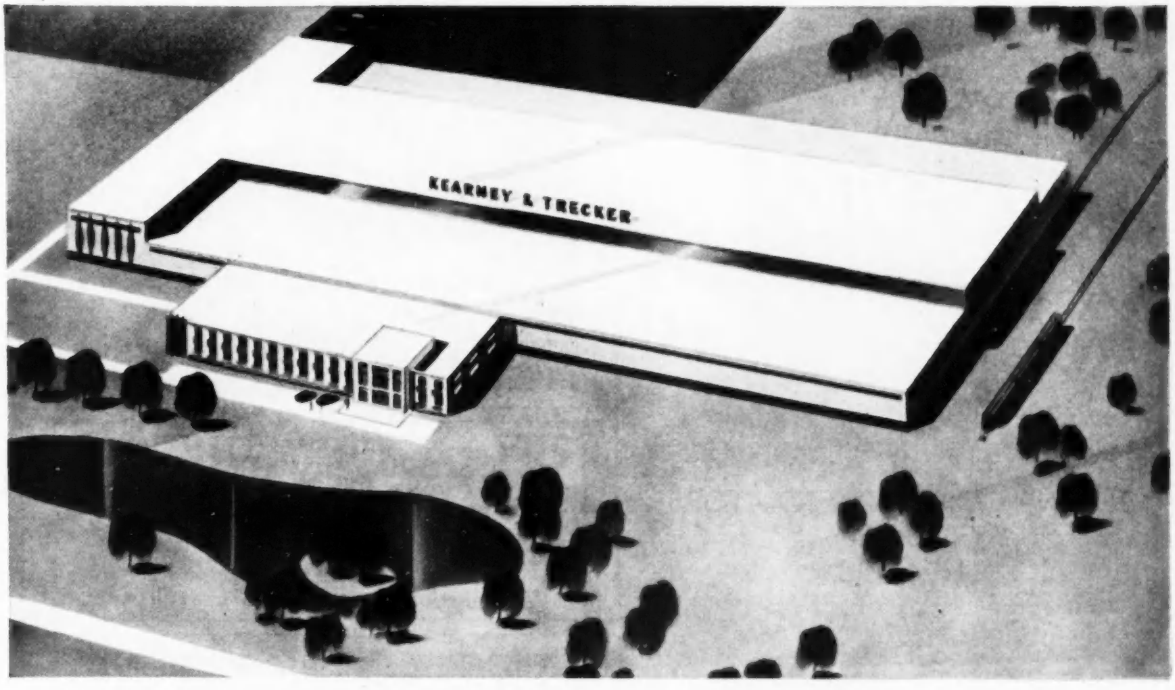
Leading stylists, like Mr. Flajole, are incorporating more and more aluminum in their designs. They recognize that aluminum offers light weight with strength, natural attractiveness, wide range of finishes, freedom from destructive rust, ease of fabrication, low cost, plus many other benefits in functional and decorative applications. They know these advantages, coupled with aluminum's design flexibility, aid in today's designs and in tomorrow's production.

Consult Reynolds Aluminum Specialists about your design or production problems. Call the Reynolds office listed under "Aluminum" in your classified telephone directory or write Reynolds Metals Company, 2587 South Third Street, Louisville 1, Kentucky.

Be sure to see "Mister Peepers" every Sunday night, 7:30 EST, NBC-TV; hear "Fibber McGee and Molly" every Tuesday night, 9:30 EST & PST, NBC.

REYNOLDS ALUMINUM

MODERN DESIGN HAS ALUMINUM IN MIND



Here it is! Kearney & Trecker's new Special Machinery Division — nearly 200,000 sq. ft. of new plant with new tools and equipment. An experienced, fully-staffed team of sales, engineering and production experts is ready and waiting to serve you . . . by engineering new production methods.

INCUBATOR . . . for Production Ideas

This plant is being built for you . . . to engineer *new* production methods — to build the large or small special machines, tools and fixtures you need to improve production and cut costs.

Production behind schedule?

Costs going up, up and up?

Will special machines, special tools and fixtures or special arrangements of standard machines help you solve these problems?

Then why not be among the first to take advantage of the 5-million-dollar-plus investment that Kearney & Trecker is making in new plant, new tools and new engineering to help you solve them.

Kearney & Trecker *is no newcomer* to the field of special machine tools and allied special equipment. During the past 50 years millions of dollars worth of Kearney & Trecker special machinery has been produced for plants all over the world. And that doesn't include the 60,000 standard Kearney & Trecker milling machines and other machine tools so well known and so widely accepted everywhere.

Kearney & Trecker is already working on new production ideas, new equipment and tool designs to be produced in this plant. Kearney & Trecker Special Engineering and Methods Analysts are ready right now to serve you with (1) Prompt response to your inquiry, (2) Immediate engineering help on your problem, plus, (3) The newest, finest and most complete facilities to build the special equipment you need — big or small.

Phone, write or wire The Special Machinery Division, Kearney & Trecker Corporation, Milwaukee 14, Wis., today. Get the facts about Kearney & Trecker's Special Machinery Division and how it can serve you.

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See our full page "ad" in the STATISTICAL ISSUE p. 399

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• STACKS
CUTS LABOR COSTS
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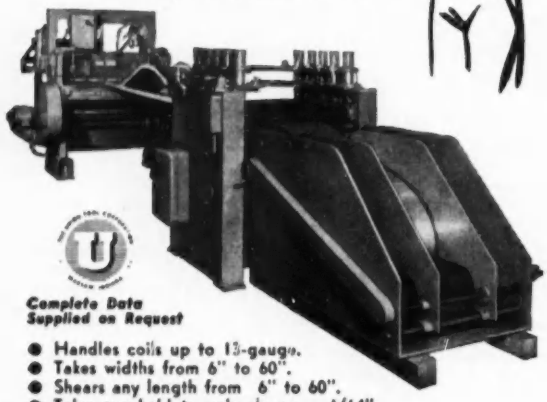
Buy in coils and cut sheet lengths as needed. No delay.



Complete Data Supplied on Request

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- Takes widths from 6" to 60".
- Shears any length from 6" to 60".
- Tolerance held to only + or — 1/64".
- Only one adjustment to change lengths.
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- Neatly stacks sheared pieces automatically.
- Will handle steel, aluminum, etc.

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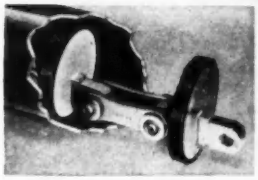
FOR SALE: 1—W. F. & John Barnes vertical center column machine with seven individual hydraulically operated heads, each head equipped with two spindles. Each head has an operating cycle of rapid approach, feed, dwell, rapid return and stop. It has an eight station hydraulically indexed station. Will accommodate work 30" in diameter. 1—W. F. & John Barnes vertical center column machine with six four spindle multiple heads, hydraulically operated. Indexing table 96" in diameter and is hydraulically indexed. Cycle of heads is same as above. In very good condition. Box 68, AUTOMOTIVE INDUSTRIES, 5601 Chestnut Street, Philadelphia 39, Pa.

BUY BONDS

want to show your management some BIG SAVINGS? Install Hapman TUBULAR CONVEYORS



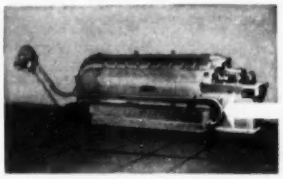
FOR METAL CHIP AND DUST REMOVAL ON 3 TYPES OF INSTALLATIONS:

1. DEPARTMENT OR PLANT-WIDE CHIP-CONVEYING SYSTEMS...

Here's the latest of many complete Hapman chip-handling systems installed in major automotive plants. In all cases, they've *proved their ability* to pay big dividends fast.

2. AS ORIGINAL COMPONENTS ON NEW MACHINES AND EQUIPMENT...

You can get low-cost, *automatic chip, dust or sludge removal* on new machines of many types by *specifying Hapman Conveyors* as original equipment. We co-operate with the tool builder.



3. ADDED TO EXISTING MACHINES OF MANY TYPES...

You can also show your Management important, quick-return savings by installing Hapman Conveyors on existing equipment such as these profile milling machines — or on broaching machines, grinders, drills, quench tanks, etc. You can *prove* the savings —

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Hapman CONVEYORS, INC.
DIVISION HAPMAN-DUTTON COMPANY
KALAMAZOO MICHIGAN

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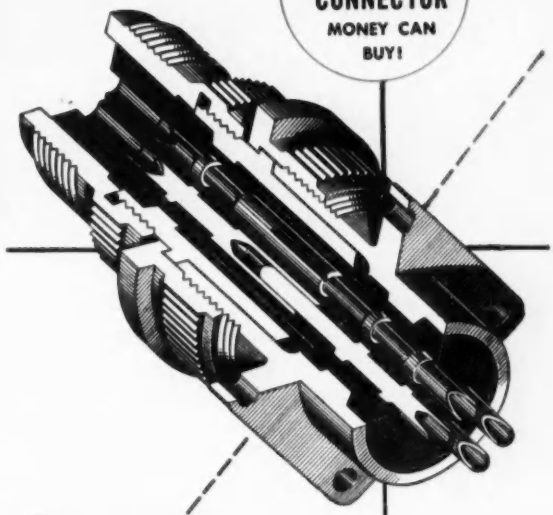

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ASSURES YOU THE LOWEST VOLTAGE DROP IN THE INDUSTRY!

When operating conditions demand an electrical connector that will stand up under the most rugged requirements, always choose Bendix Scinflex Electrical Connectors. The insert material, an exclusive Bendix development, is one of our contributions to the electrical connector industry. The dielectric strength remains well above requirements within the temperature range of −67°F to +275°F. It makes possible a design increasing resistance to flashover and creepage. It withstands maximum conditions of current and voltage without breakdown. But that is only part of the story. It's also the reason why they are vibration-proof and moisture-proof. So, naturally, it pays to specify Bendix Scinflex Connectors and get this extra protection. Our sales department will be glad to furnish complete information on request.

• Moisture-Proof • Radio Quiet • Single Piece Inserts • Vibration-Proof • Light Weight • High Insulation Resistance • High Resistance to Fuels and Oils • Fungus Resistant • Easy Assembly and Disassembly • Fewer Parts than any other Connector • No additional solder required.

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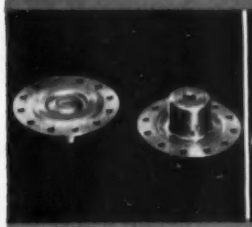
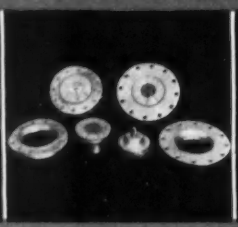
PRECISION *is Vital in Aircraft Filler Tubes and Caps*

We make all of these aircraft components under *rigid precision requirements.* Tank pressures from 10 to 100 P.S.I. are greatly increased by flight maneuvers, especially on military planes. Shown here are caps, tubes, valves, adapters . . . for fuel, oil, coolant, water . . . single or multiple use . . . flush or non-flush installations.

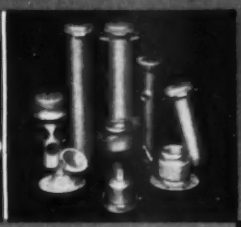
Wide range of design in filler tubes and caps.



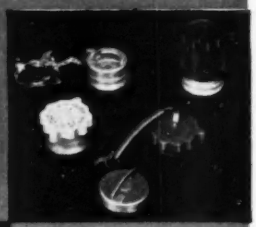
Flush-type fuel tank drain valve.



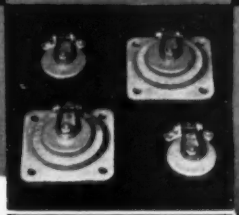
Type 3 — Flush-type filler cap and adapter.



Type 1, 2 inch — Filler cap and tubes.



Filler caps for 15 P.S.I.



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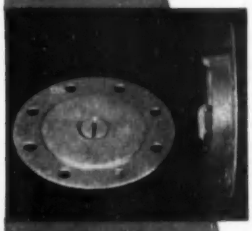
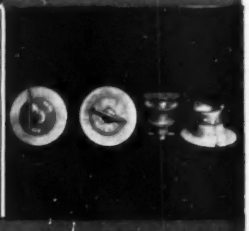


Type 2 — Filler cap and adapter assembly weighing 10 ozs.

Filler unit for Air Force planes. Type 1, 3 inch — Filler cap and adapter assembly.



NAF 1152 series tested to exceed 15 P.S.I.

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Research • Development • Engineering & Manufacturing • Springfield, Ohio

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Quick-Connective Couplings Are His Business

BUT SO ARE AIR LINE PROBLEMS

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use the HANSEN man's know-how

...backed by experience in hundreds of plants!

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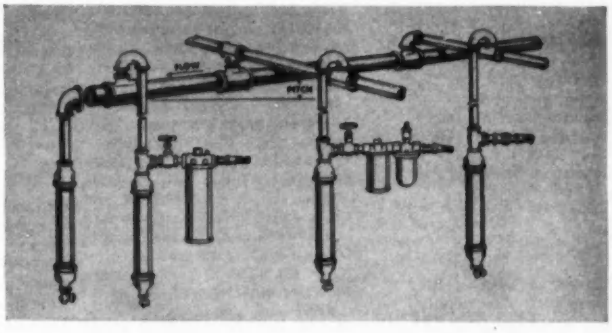
The main job of the Hansen representative, of course, is to supply you with exactly the right couplings for your particular requirements. But from years of on-the-job experience with almost every type of fluid line installation, he can also give you real help on such matters as the pitch of your lines, proper take-off, location of drains and other details which insure a moisture-free circuit operating at maximum efficiency.



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1. QUICK CONNECTION AND DISCONNECTION **2.** INSTANT AUTOMATIC FLOW OR SHUT-OFF

One-Way Shut-Off

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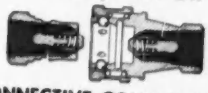

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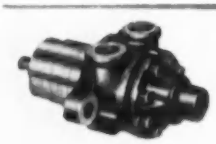

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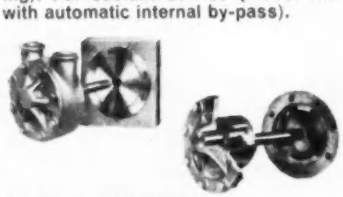

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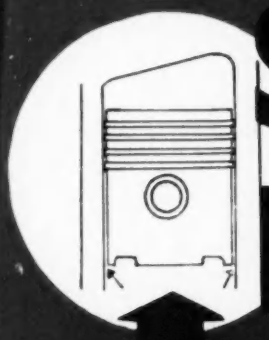

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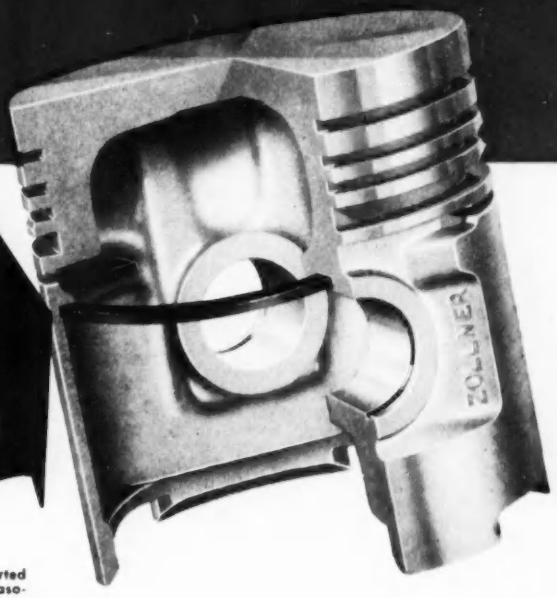

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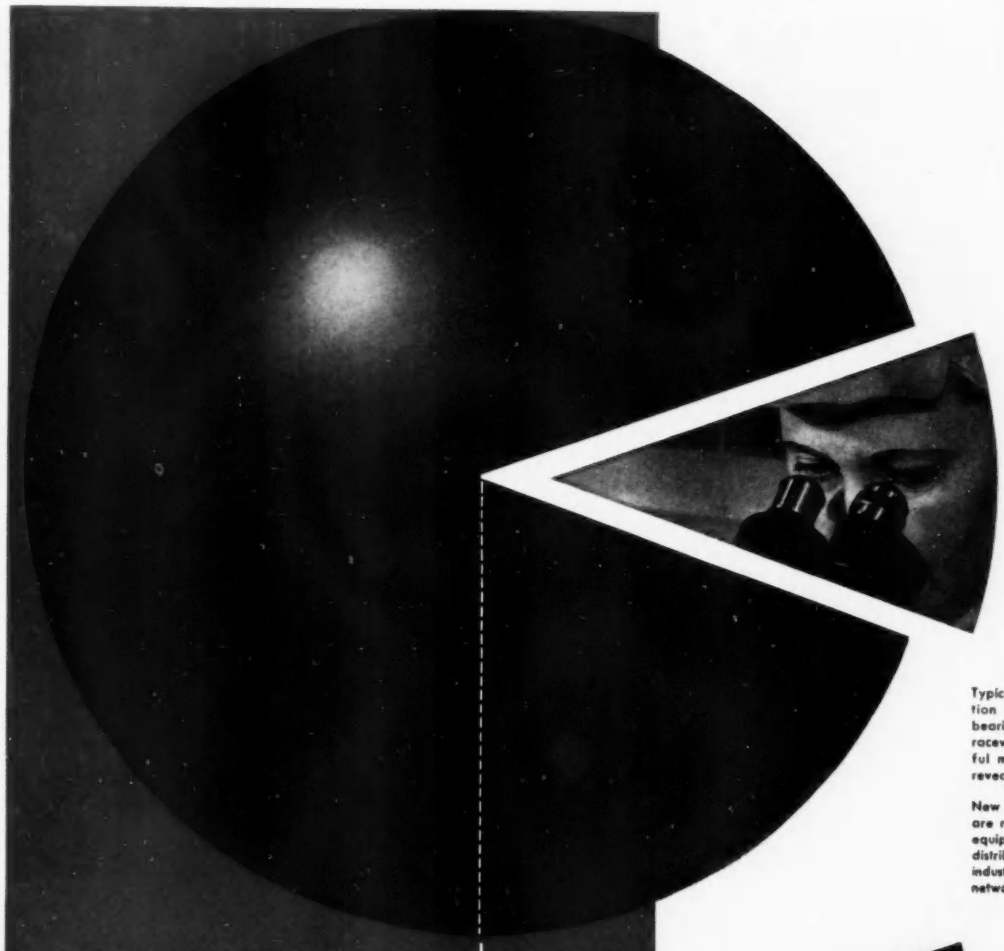

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